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MACHINE FOR DRAWING AND GLOSSING SILK IN SKEINS.

The object of drawing and glossing is to give the necessary brilliancy to silk in skeins after dyeing and drying. These operations permit likewise of dressing and equalizing the fibers of a hank of silk so as to render them very even. Since the origin of this industry, which arose at Crefeld, on the banks of the Rhine, the want of special workmen, and the difficulty of initiating others into an operation of this kind, which is laborious and difficult of acquisition, has led to the seeking of a means of doing the work by mechanical means. This gave rise, then, to machines for glossing and drawing. Those which are still in operation in the province of Düsseldorf are scarcely anything more than primitive ones that have undergone but few improvements.

Later on, when the mechanical means adapted to this kind of work were imported into Lyons, manufacturers of machinery, taking a more practical view of the subject, brought out machines that possessed important advantages over the first. Meanwhile the problem still existed as to the final improvements to be reached, and it was for the purpose of solving it perfectly that Messrs. Pierron & Dehaitre were led to study a new type of machine which goes to increase the series of apparatus that they are manufacturing for dyeing and finishing.

In the operation of glossing, the silk in hanks (sometimes still a little damp after dyeing and drying) is submitted to a slight drawing by means of polished iron or steel rollers revolving in the same direction. A jet of steam forced into a chest containing the skeins hastens the operation, and facilitates the drawing by softening the fibers of the silk through the humid heat developed. The fibers thus become less brittle.

The Prussian machines have only two cylinders, and so they can treat but one hank at a time. Besides, the tension and rotation in these are effected by hand. For these reasons the quantity treated is limited, and the expenses of manipulation are high.

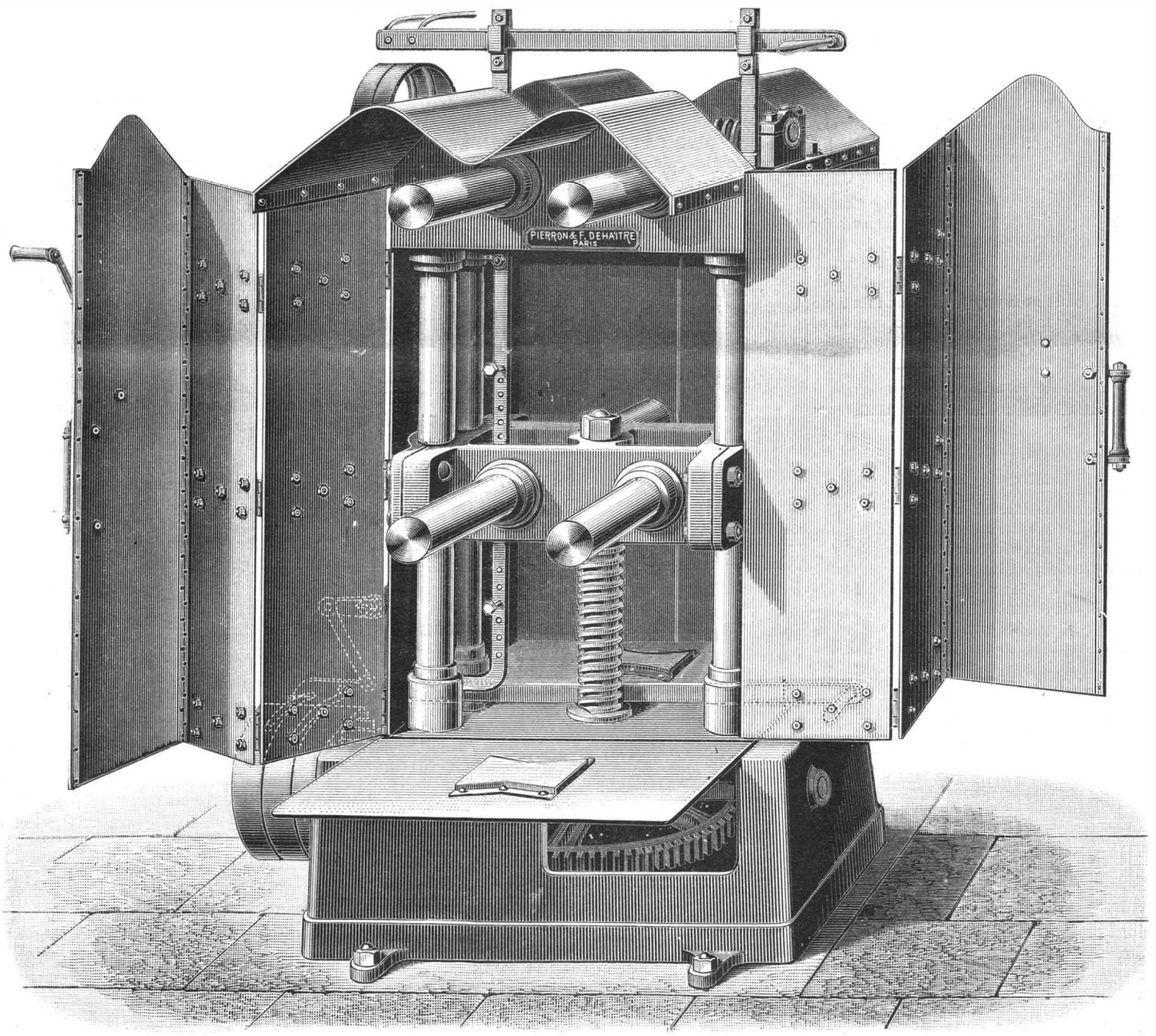
The Lyons machines have four cylinders, and are capable of treating two hanks at a single operation. The cylinders are actuated by a motor that acts directly, or through the intermedium of a belt. Here again the tension is exerted by hand.

The new type shown in the accompanying cut has eight cylinders, on which may be drawn and glossed four hanks simultaneously. Moreover, the rotation of the cylinders and tension of the hanks are effected by mechanical devices that are grouped upon the machines. The role of the workman is limited, then, to a manipulation of the hanks—placing them on the rollers and taking them off when the operation is finished. One man is sufficient to operate one machine, and the production reaches double the amount obtained with other machines; these latter requiring two operators, one for placing the hanks, and the other for giving them the requisite tension.

In principle, the new machine consists of a combination of four headstocks, each formed of two cylinders for receiving the skeins. In the figure only two head-stocks are visible in the front part of the apparatus; but the other side has precisely the same arrangement. The mechanism is inclosed within a chest or closet of plate iron, that opens at each side by folding doors, which permit of the ready insertion and removal of the skeins to be operated upon. Near the lower part of these compartments are situated the cocks for distributing the steam, and which are covered at a few millimeters distance by a copper counter-plate for preventing the steam from being projected directly on the skeins.

The construction and operation of this machine present some interesting peculiarities. The two lower cylinders run in the bearings of a movable iron carriage, to which the columns serve as guides, and whose middle cross-piece is traversed by a screw, by means of which the carriage is made to rise and descend. This screw, which, like the cylinders, is of steel, is firmly connected to the carriage by a nut, and is guided in bearings belonging to the base. The motive nut, which is of bronze, is held between the bearings, and is keyed to a cog-wheel gearing with a pinion that receives a small vertical axle. This latter revolves through the action of two gearings, one of which brings about a quick return during the ascent of the carriage. On the horizontal shaft, which carries three pulleys, are keyed two pinions, which gear with beveled wheels on the intermediate vertical axles. The pulley nearest the frame is loose on its axle, and connected with the one of the pinions that actuates the carriage in one direction. The external pulley, like the second pinion, is fastened to the shaft so as to give the screw, and consequently the carriage, a motion contrary to the preceding. Finally, the loose pulley in the middle is the one that permits of stopping the machine.

The lower cylinders are free in their bearings, and revolve by virtue of the tension and motion transmitted by the skeins as they are moved by the upper cylinders. Between



MACHINE FOR DRAWING AND GLOSSING SILKS IN SKEINS.

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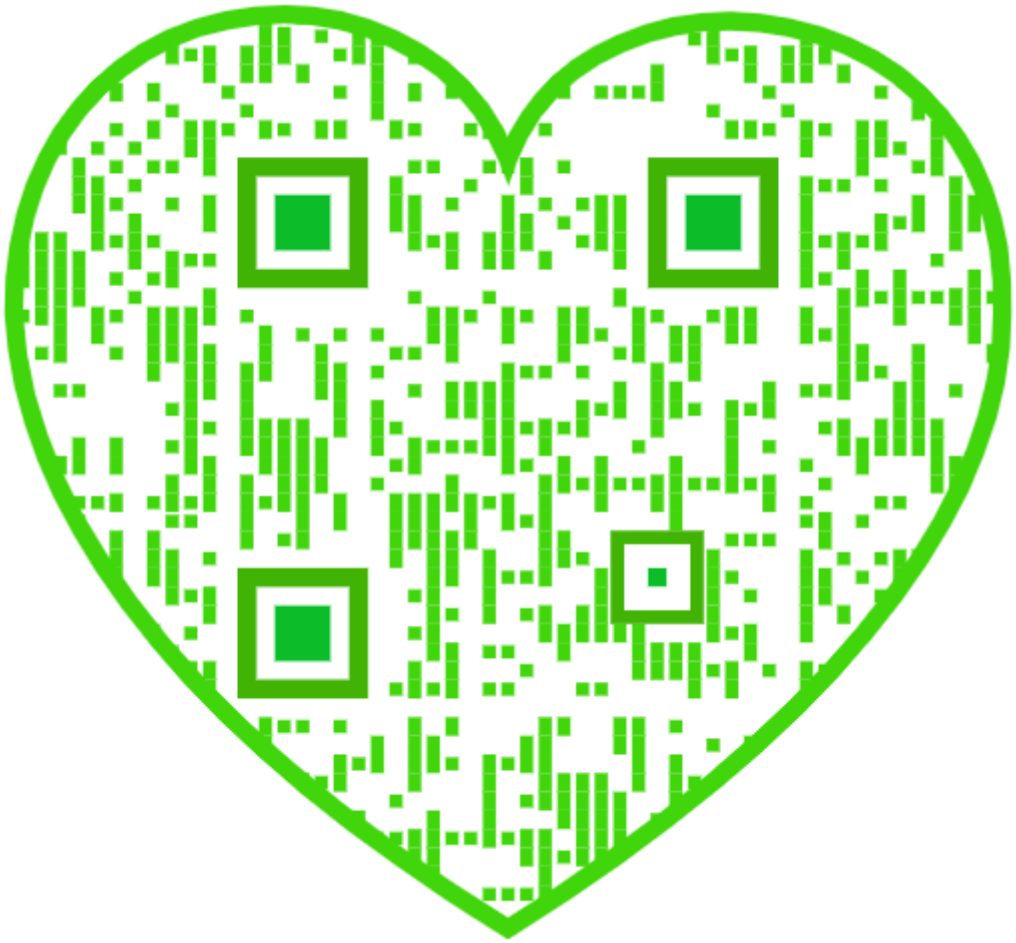

these latter, and in a reservoir contrived in the frame, there are fastened toothed wheels that gear with endless screws. The latter are actuated by a special shaft which carries fast and loose pulleys that connect with a disengaging gear. Owing to a peculiar arrangement, the wheels dip constantly into oil, and, in their motion, carry the lubricant to the steel endless screws. At the beginning of the operation, the compartments of the chest and the cylinders are heated with steam that enters in a continuous current. This introduction of steam must be kept up until there is no longer to be feared any condensation of it on the internal parts of the machine with subsequent vaporizations. When the carriage occupies a position sufficiently high to permit of putting the skeins on the cylinders, the horizontal reversing bar is acted upon so as to throw into gear the mechanism that determines the descent of the carriage. Then, the moment the skeins possess a definite tension, the upper cylinders are made to rotate, and the workman who runs the machine closes the doors of the apparatus. Steam is afterward admitted for a second time in order to render the silk warm and moist, to prevent the breakage of the threads, and so as to begin the glossing, the latter being effected principally on the lower cylinders. As these latter are carried along solely through the effect of the great tension of the skeins, there takes place on all the cylinders a slipping which proves very effectual in bringing about the glossing.

After the operation has proceeded for a few minutes, the tension is increased so as to render regular the threads and skeins that have been relaxed by the heat. The stress to be exerted varies according to the nature of the silk and the effects to be obtained.

The vertical travel of the carriage is limited automatically in its ascent and descent by means of a disconnecting gear consisting of a vertical rod connected through several levers with the horizontal reversing bar.

By reason of the length of the skeins the carriage acts sooner or later on the vertical bar by means of tappet-cams placed at the limits of the travel, and such action effects the transfer of the belt to the loose pulley. In order to obtain a completer glossing, there may be added to the upper cylinders top rollers for pressing the skeins. Such an arrangement, being optional, and applicable to special articles, is not shown in the cut.

Although these machines are more especially constructed for treating silk, they may be employed for cotton and for the delicate woolen threads that serve for making bareges, grenadines, and gauzes. Such threads, which are much twisted, readily assume a spiral form after bleaching or dyeing, and it then becomes necessary to draw and fix them by a vaporization in order to fit them for the operation of weaving.—*Revue Industrielle.*

Professor Wohler.

Professor Wöhler, of Göttingen, the Nestor of German chemistry, at the ripe age of eighty-two, peacefully died at Göttingen, of the university of which he has so long been the ornament. Born in the first year of the century, when our science was also young, Wöhler has lived to see it assume its present gigantic dimensions, much of its growth being due to his own labors. In Wöhler's death is dissolved the principal living connection and tie uniting in life experience and memory the early infancy with the now riper maturity of our science. Berzelius was his early friend, and Liebig his colleague in middle and advanced life. The year 1828 is memorable as that of, perhaps, his greatest discovery, when he broke down the barrier between the two great divisions of our science by the artificial production of urea. His researches extend over the whole domain of chemical science; the early ones with Liebig marked an era in the progress of organic chemistry, while his later ones were no less productive in the inorganic branch. Urea, benzoyl, cyanic acid, aluminum, silicon, and boron, call to mind discoveries with which the name of Wöhler will be for ever connected. No longer shall we see the familiar name "F. Wöhler" on the yellow cover of the *Annalen,* but it will always be retained in the minds and hearts of chemists as recalling to them the steady, fruitful, lifelong work of a great laborer in the vineyard of science.—*Jour. Soc. Chem. Ind.*

The Advantage of Knowing how to Swim.

The Sydney *Morning Herald* of August 25 says: "We learn from a correspondent that, a short time ago, Mrs. G. A. D. McArthur Campbell, formerly a resident of Coonamble, distinguished herself by a deed of admirable bravery. Mrs. Campbell was a passenger in a steamer from Hongkong to one of the northern ports of Queensland, and one day a little boy about four years of age, to whom the lady was much attached, fell overboard, the accident occurring through a sudden lurch of the vessel. With the exception of Mrs. Campbell and the man at the wheel, all the passengers and crew were at dinner. Without waiting for a life buoy or divesting herself of any clothing, and simply saying to the man at the wheel, "Don't tell the child's mother," Mrs. Campbell plunged into the water, swam to the boy, and held him up till both were rescued, the steamer having been promptly stopped and a boat lowered. Neither the lady nor the boy was much the worse for the immersion."

IT is asserted that in the three years ended 1880 there were no fewer than 252 theaters destroyed by fire, or partly so, resulting in 4,370 deaths, and about 3,400 injuries.

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AN IMPORTANT DECISION BY THE COMMISSIONER OF PATENTS.

A decision of considerable interest and importance, especially to manufacturers and patentees, has lately been made by the Commissioner of Patents relative to the registration under the design patent law, of new forms for patterns and articles of manufacture.

Heretofore the Patent Office has held that this provision of law was applicable only to ornamental objects; and the practice of the Patent Office has been to allow patents only for new designs for decorative work; such, for example, as the beadings upon the edge of a spoon handle, or a new style of edging for lace; but when application was made for a patent for a new and better shape for the frame of a steam engine or other machine, or for a better form for a chair, table, or article of manufacture without reference to its adornment, in all such cases it has been the custom of the Patent Office to reject the application. This has greatly limited the value and utility of the design patent law. Last year, out of 31,000 new applications made for patents and caveats only 854 were for design patents.

For many years we have contended that this official practice was illegal and contrary to the intent and spirit of the statute. We have maintained that the design patent law was intended to encourage the production of new forms and designs, in every possible branch and ramification of industry, and to secure protection therefor to the designer and manufacturer, substantially in the same manner that a copyright secures the rights of an author.

If an individual writes a history of America he may at once obtain a copyright, which amounts to a patent, for the contents of his particular book. It does not prevent other people from writing histories of America; but it secures to him, for a few years, the exclusive right to make and sell copies of his special production. We think that the design patent law was intended in like manner to protect designers and manufacturers of improved or better forms of goods and other objects.

We are glad to observe that the Hon. E. D. Marble, the Commissioner of Patents, has adopted this view of the subject, and that the Patent Office is now open to the reception of design patent applications on this basis. The commissioner's new decision, rendered October 2d last, was given in a case in which the applicant claimed a design patent upon an improved form for a "T shaped shingle machine frame." This application was rejected in the customary manner by the primary examiner, on the ground that it was not ornamental; and the Board of Examiners in Chief confirmed the rejection. An appeal was then taken to Commissioner Marble, who reversed the previous decision and ordered the patent to be granted. He says:

"I think, in articles of manufacture like the one under consideration, if the applicant has by his industry, genius, and efforts made a design of an article of manufacture, viz., the frame of a shingle machine, which, because of its design and not because of its mechanical structure, commends itself to persons desiring to purchase such articles, it is useful, and the applicant should be protected in its manufacture and sale. It is not necessary that it should be ornamental, although it may be, to entitle the applicant to a patent therefor. The utility in an article of this kind consists in having a shape or configuration of such a character that persons needing it will purchase it because of its shape or configuration, in preference to other articles for the same purpose, but different in shape and configuration. Applicant, however, must strike out of his application everything descriptive of the mechanical functions of the device."

This is clear and plain reasoning, and while Commissioner Marble remains in office the primary examiners will understand that the old practice is set aside, and that patents are now to be allowed upon all improved forms of machines, or other articles of manufacture, or the parts thereof.

One of the conveniences of the existing design patent law is that a patent may be taken for a brief term at a small cost. The law permits the applicant to elect one of three periods for the life of his patent, the costs being governed accordingly, namely, three and a half years, government fee, $10; seven years, $15, and fourteen years, $30. Where the nature of the article is such that the public demand for the new pattern is likely to be transient or soon over, the applicant may take a patent for the shortest term of three and a half years; but it is to be remembered that the term first chosen cannot be afterwards extended. If the patent is granted for three and a half years, it expires at the end of that term, and it cannot be extended by making a new payment.

To the costs above mentioned are to be added the expenses of making the specifications, claims, drawings, etc., which are substantially like those connected with other patents. Manufacturers and others who desire further information may obtain it, free of charge, by writing to the publishers of this journal, Messrs. Munn & Co., who for now going on forty years have made it a large and successful branch of their business to obtain patents caveats, trade mark registrations, etc, for authors and inventors.

We have no doubt that Commissioner Marble's decision will give a new impetus and create a new departure in the art of designing in this country. It is a field of study and labor that is open to women as well as to men; all, in fact, who have the wit or genius to produce a better style or form for any species of industrial work or object may secure a patent therefor.

The design patent law also presents to manufacturers the

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opportunity of fortifying their original patent rights by securing design patents upon any improved patterns or forms used in the production of any portion of their improved goods.

In order to give our readers an idea of the broad and far-reaching nature of the design patent law, as interpreted by the present able and liberal minded Commissioner, we will here quote the language of the statute itself:

"Any person who, by his own industry, genius, efforts, and expense, has invented and produced any new and original design for a manufacture, bust, statue, alto-relievo, or bass-relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics; any new and original impression, ornament, patent (pattern), print, or picture to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture; or any new, useful, and original shape or configuration of any article of manufacture, the same not having been known or used by others before his invention or production thereof, or patented or described in any printed publication, may, upon payment of the fee prescribed, and other due proceedings had the same as in cases of inventions or discoveries, obtain a patent therefor.

"The Commissioner may dispense with models of designs when the design can be sufficiently represented by drawings or photographs.

"Patents for designs may be granted for the term of three years and six months, or for seven years, or for fourteen years, as the applicant may, in his application, elect."

THE NOVEMBER METEORS.

On the 12th, 13th, and 14th of November, the earth plows her way through a swarm of meteoroids known as the November meteor-zone. There is no reason to anticipate any special display at the present passage, but everything relating to comets, meteors, and the curious connection existing between them is now specially attractive on account of the interest aroused by the visit of the great comet.

The November meteor-zone is made up of a swarm of meteoroids revolving around the sun in an orbit of great eccentricity, the perihelion resting on the earth's orbit, and the aphelion extending beyond the orbit of Uranus. The earth passes through the portion resting on her orbit every year about the 13th of November. The immense width of the zone may be inferred from the fact that the earth, moving eighteen miles in a second, is three days in passing through it. The meteoroids are not equally scattered around the orbit, the thickest portion extending along about one-fifteenth of the space. The earth meets the thickest portion of the swarm once in thirty-three years and a quarter, and the event is signalized by a dazzling display of shooting stars that ranks among the most awe-inspiring and beautiful celestial phenomena on record. At other times, the earth encounters a portion of the zone either almost destitute of meteors, or where they are sparsely scattered. There cannot be a grand meteoric shower unless the earth and the swarm of meteors cross at the same time.

The November meteoric showers thus took place with a few straggling falling stars annually, and a great display occasionally, and no one was able for many centuries to find out the secret of their action. But busy brains were at work, and keen eyes were watching the ways of the cosmical atoms. At length it was proved that the period of revolution was thirty-three and a quarter years, and more wonderful still, it was discovered that a faint telescopic comet, known as Tempel's comet, was moving in the same orbit as the meteors were. Astronomers seized the key and worked out the problem.

It is now clear as day that the November meteors are caused by the earth's encountering a swarm of particles following Tempel's comet in its orbit, and completing the circuit in thirty-three and a quarter years. The comet's tail is actually splitting into meteors that thus far fill but one-fifteenth of the zone, but will in time be scattered through its whole extent as has already taken place in the August meteors, a much older system connected with a comet in the same way.

It is therefore easy to see that once in about thirty-three years the earth and the tail of Tempel's comet will meet on the celestial road, and the result will be a rain of fire, shooting stars falling like snow. Many observers now living will remember the superb meteoric showers of 1833, and 1866–67. By consulting astronomical annals, these showers have been traced back for a thousand years. The next one may be expected in 1899, and is eagerly anticipated among coming celestial events.

The recent origin of the November meteors is proved from the fact that the thickest portion of the swarm at present extends over a comparatively small part of the zone. Leverrier, a famous French astronomer, gave an ingenious theory to account for the introduction of the meteoric ring into the system, and calculated the time when the event occurred. The four giant planets exert a powerful attraction upon the comets that come near them. Jupiter is especially distinguished in this line, and is called the great comet disturber for this reason. The theory is that about the year 126 of the Christian era, Tempel's comet passed near Uranus. The planet's attraction changed the comet's orbit into an ellipse, revolving about the sun in the track we have already described. Ever since it has continued to revolve in its new orbit, its tail all the while breaking into meteors which finally will fill the whole zone. Therefore we must wait till 1899 for a rain of shooting stars on a grand scale. Meantime we must be contented with the few stragglers that in the passage of the earth through the zone in the present month will impinge against our atmosphere, and being ignited by the concussion, trail their shining way through the heavens.

The radiant point of the November meteors is in the constellation Leo. The most favorable time for observation is about 3 o'clock in the morning, for the starry group is then well up in the east, and the tiny visitors may be seen to the best advantage.

Comets and meteors are now among the most interesting objects of astronomical research, for they are closely associated if not identical. It is not improbable that their fall upon the sun in numbers of which we can form no conception, instead of being a cause of alarm, may serve as fuel to keep up his fires, and thus prolong his power of giving life and heat to the earth.

MAGNESO-CALCITE FOR SAFE LININGS.

A public exhibition of the fire-resisting qualities of magneso-calcite, a new lining for safes, bank vaults, warehouse shutters, express chests, jewelry cases, and the like, was given in this city, October 29, under the direction of Mr. William Hoey, of Adams Express Company.

Three boxes lined with magneso-calcite were subjected to a severe fire test. The larger was an iron chest, of the sort used by express companies in transporting valuables. Books, bank notes, cigars, and other combustibles inclosed in the chest were found uninjured after three hours' exposure of the chest to intense heat. The two smaller boxes of sheet iron, and with one inch lining, were an hour in the fire. When withdrawn and cooled their contents were found intact and free from stain or any other sign of exposure to heat.

The fireproof lining is composed of sheets of asbestos paper and paper board charged with a heat-resisting composition. The lining is tough and elastic, and is calculated to add strength to the walls of the boxes or safes in which it is used.

There would seem to be a wide field of utility for the new composition, in the construction of fireproof partitions, floors, and roofs, as well as for doors, windows, shutters, and safes, its lamellar structure giving it many advantages.

CHARLES DESNOS.

Many readers of the SCIENTIFIC AMERICAN will learn with much sorrow of the death of Mr. Chas. Desnos, the well known civil engineer and patent solicitor in Paris.

The extensive offices of Mr. Desnos on Boulevard Magenta were frequented by inventors and scientific men from all countries, and many of our American patentees will recollect with satisfaction the cordial manner they were received by the genial engineer now dead, and how ready he ever was to render them counsel in matters pertaining to their patents and practical advice as to the best means of introducing their inventions into France. Mr. Desnos had been in poor health for several weeks, but his recovery was not despaired of till he was stricken with apoplexy on the 15th of October, which terminated his life. Mr. Desnos's loss is not to his family and intimate friends alone, but in scientific circles and by inventors whose friend he was.

Importance of Cleaning Machinery.

In a recent article of a Continental journal devoted to the art of watchmaking, the necessity was demonstrated of having a watch regularly cleaned, at least every two years, in order not only to insure its regularity of action, but also to preserve it in good condition, and to prevent its being unduly worn out. It was specially pointed out that the balance of an ordinary watch revolved at a rate which would perform a journey round the world in four and a half years (the calculation was demonstrated by figures which, however, cannot interest us here), and it was pointed out that during this traverse the action of the watch in all its parts was constant, and never was allowed to rest for a single second; no bearings were given time to cool, and no parts taken out and readjusted, and that in this manner a watch was required to work well under circumstances which are not expected from any other machine extant. These observations struck us, says the *Textile Manufacturer*, as peculiarly pertinent with respect to textile machinery, which, of all other, is perhaps that which comes nearest a watch in its complexity, and runs regularly at the highest speeds.

We once heard it stated, though we never examined the assertion, that the shuttle in an ordinary calico loom runs at the rate of ten miles per hour—a speed which would carry it round the world in six months. A ring spindle, running at the rate of 7,000 revolutions per minute, goes much faster; both have moments of rest during the day, and enjoy repose for about twelve hours at night, but while they are at work they certainly are not idle. Now, it must stand to reason that any part of a machine, being in constant motion at such a high speed, must be subjected to a great deal of wear and tear unless the friction be reduced to a minimum by perfect lubrication and great cleanliness, both matters which in many places leave much to be desired.

We have sometimes heard comparisons made between this or that spindle, or the metal of this or that bush, to the detriment of those supplied by one maker or another, when in reality the fault lay only in the greater attention paid to cleanliness and good oil in one mill over another. It would hardly be believed, the *Manufacturer* further adds, if we stated the condition in which the machinery in some mills is kept; it is lubricated (?) by any cheap compound which rejoices in the name of oil; dust and dirt are allowed to fly about in the air and to settle on the machinery, and all cleaning is done superficially, so as only to satisfy the general appearance, while a thorough cleaning of those parts which do most of the work, and are generally out of sight, is neglected. That such mills cannot come up to the speed of others, and if they attempt to do it have soon the principal machines worn out and shaky, is then not to be wondered at. There are, however, other mills in which things are differently managed, where the utmost cleanliness is to be observed everywhere, where generally one machine of a kind is over and above the required number, and thus there is always one which is periodically thoroughly overhauled, all bearings examined, any worn ones repaired or renewed, all parts thoroughly cleansed and adjusted, and thus the whole machine kept as near perfection as possible. Such machinery will then also run smoother, easier, and faster than the neglected ones, and do this for a number for years. Let any one who wishes to have a clear idea of this attend a few sales by auction, where he would have leisure to examine the machines; many of these nowadays have the date of their production cast on; he will thus often find that machines which have been in constant use for ten and fifteen years are in a better condition than others which have only run half that time.

We could say much about the quality of the oil to be used, the best speed of the machines, a good foundation, perfectly level position, or a steady turning, but these considerations would carry us too far for the present. What we wish to point out here is only the necessity of cleanliness, and a periodical overhauliug of the machines in any mill, be it spinning or weaving, and to show millowners that, if they wish to do the most with them, they must keep them constantly as near perfection as it is possible to do. If it costs a little extra money, if the acquision of an additional machine absorbs a little capital, this will soon be repaid by the saving in the condition of the machinery, and a better, as well as greater production.

Tile Fish.

Speaking of the disappearance of tile fish from waters in which they were so plentiful a year ago, Professor Baird, Chief of the U. S. Fish Commission, said, recently:

"These fish belong to the western edge of the Gulf Stream and inhabit the water lying about seventy-five to one hundred and twenty fathoms below the surface. Last year they were seen in such abundance that our men could have taken twenty-thousand pounds if necessary. Suddenly in the spring they began to come to the surface alive, give a convulsive struggle, and then lay on their backs dead. They are now extinct for ten thousand square miles. They can have been killed by three known agencies—heat, cold, or gaseous exhalations. The first is improbable, and no gases can well have been liberated without an earthquake, which would have been accompanied by a tidal wave on shore. There were during last winter a large number of icebergs liberated from the Arctic regions. The cold water from these would naturally descend and probably formed a sub-current at the swimming level of the tile-fish. Those to the south of the section we visited have, no doubt, escaped and will be discovered in due time."

While cruising south of No-Man's Land and Martha's Vineyard this year, Professor Baird's steamer passed through ten miles of menhaden or moss-bunkers, a fish which was supposed to have disappeared. Professor Baird also alluded to the fact that, in the Gulf of Mexico, hundreds of tons of fish are sometimes killed by the "northers." He therefore thinks there is reason to hope that the tile fish may reappear in its old haunts.

The Sleeping Car Interests.

The Chicago, Milwaukee, and St. Paul Railway Company has recently made with the Pullman Palace Car Company a contract whereby the latter assumes control of the sleeping car service of that road and its associates, having a total length of 4,500 miles. This gives the latter company a continuous service from the Atlantic to the Rocky Mountains, with a prospect of speedy extension to Oregon and California. Speaking of the change the *Railway Age* says that the sleeping car companies are now reduced to three—the Pullman with about 900 cars, the Wagner with 250, and the Woodruff with about 70. A few companies run their own sleepers—among them at present the Baltimore and Ohio, St. Paul, Minneapolis and Manitoba, and Central Pacific. On the other hand, several companies have tried the experiment and abandoned it—among them the Chicago, Rock Island and Pacific, after about twenty years of independent operation, the Northern Pacific, soon to be one of the great transcontinental lines, and the Illinois Central, for its through service. It is not unlikely that others of the great lines now running their own sleepers will soon follow the course of those last named.

Coal Product of Illinois.

The State Bureau of Labor shows that Illinois ranks next to Pennsylvania in the production of coal. The output for 1882 was 9,000,000 tons. Last year the yield was 6,000,000 tons. The coal mines are found in forty-six of the hundred counties of the State. The value of the year's yield of coal at the mines was nearly $14,000,000.

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EVAPORATION OF LIQUIDS.—WAHL'S IMPROVED VACUUM PAN.*

Evaporation and concentration of liquids is an operation of special importance in most every one of the chemical industries. Solutions of sugar, glucose, glue, extracts of dyewoods, tanbark, meat, and other substances, wort, milk, and a great many other liquids have to be concentrated by evaporation, to either advance them in the course of manufacture or to bring them into a marketable condition. For all these purposes vacuum pans are now generally used, as they allow the evaporation to be carried on at a comparatively low temperature, and thus largely diminish the chance for liquids becoming colored or undergoing changes in their chemical composition. But although these dangers are diminished, they are by no means entirely obviated, for even in vacuum pans of the best construction, solutions are colored and decomposed to a more or less extent. Cane sugar is converted into molasses, glue into glycine, while all other substances are colored in a more or less degree, owing to the long time during which the liquids are exposed to the temperature in the vacuum pan.

Mr. C. Wahl, of the firm of Wahl Bros., of Chicago, who in many ways have advanced the manufacture of glue, fat, and other animal products, conceived the idea that a pan might be constructed in which the liquid would have to remain the shortest possible time while being evaporated. The construction of the vacuum pan, illustrated in the accompany cuts, Figs. 1 and 2, is the result of his endeavors, which, as it will be seen, were crowned with perfect success.

Fig. 1 shows a view of the pan and a part of the inside arrangements; the pan is provided with the usual attachments, eyeglasses, D, a condenser, F, vacuum gauge, thermometer, etc., but the liquid to be evaporated, instead of being filled into the pan in one bulk, passes gradually through the spiral shaped canal or gutter, A, which is shown separately in Fig. 2. The space formed between this continuous channel and the bottom of the pan is used as a steam jacket, the heating capacity of which is increased by a coil of steam pipe, B, running along on the bottom of the channel. *d* and *c* represent the inlets, and *e* and *f* the outlets for the steam. The liquid to be concentrated runs in at *b*, and after being concentrated issues at *g*, and runs into a vessel, G, located about thirty feet below the vacuum pan. Where the localities do not admit of this latter arrangement, the concentrated liquid must be pumped out, in which case vessels to be used alternately will be found convenient for the reception of the concentrated mass. It will be seen that the operation of this pan is continuous, and that its working can be regulated with the precision of clockwork by the admission of liquid through the faucet, *b*. While in the old style pans large batches containing up to fifty barrels are treated at the same time, being exposed to the high temperature for hours and more, in Wahl's pan every drop, so to speak, is treated by itself, and leaves the pan after having attained the desired concentration, which is accomplished in a few minutes, owing to the effective application of heat, which has to penetrate a low column of liquid of one-half to two inches height at the utmost.

The high column of liquid in the old style pans also causes violent ebullition and overboiling, which cannot happen with this improved apparatus. At the glue works of Messrs. Wahl Bros., of Chicago, these pans have been in successful operation for some time past, and parties desiring any further information will receive prompt answer by addressing them. The use of this pan is not confined to the evaporation of liquids, but the principle involved may also be applied in the cooling of liquids, such as wort, etc. The drying of lard oils and other substances can also be effected in this apparatus in the shortest possible time and without discoloration and decomposition.

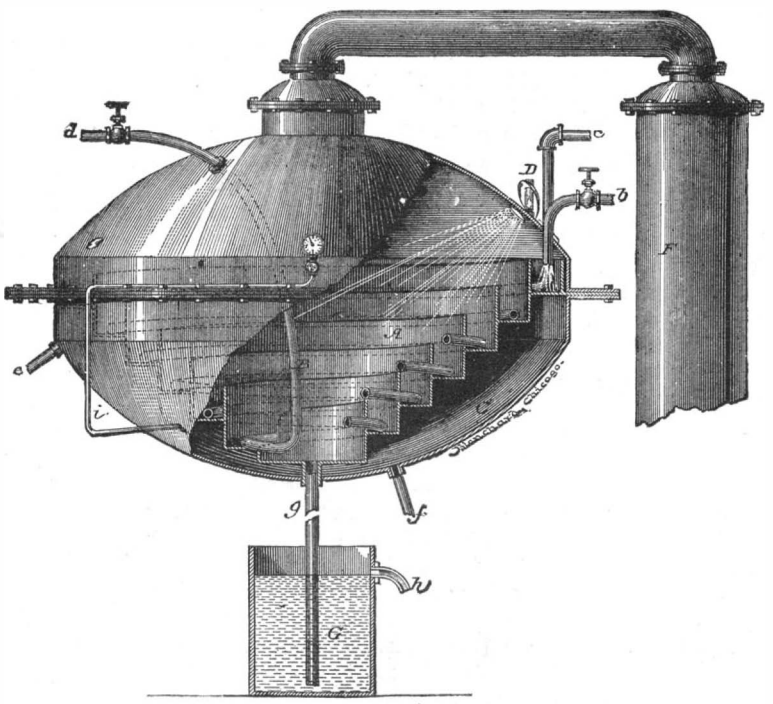

Fig. 1.

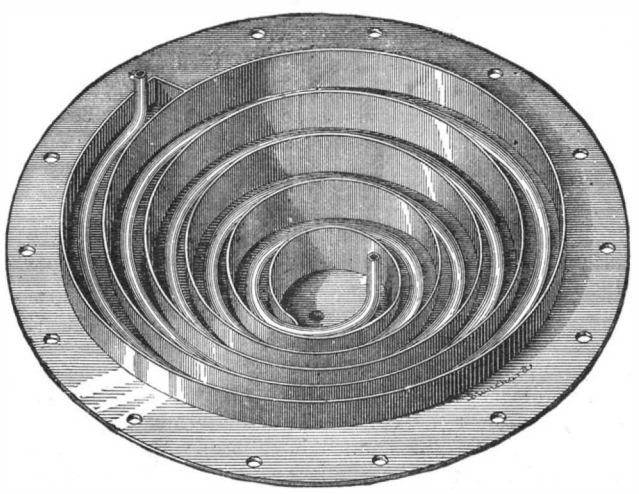

Fig. 2.—WAHL'S IMPROVED VACUUM PAN.

Hurricanes and Waterspouts on Lake Tahoe.

Lake Tahoe, Nev., is famous for squalls, hurricanes, and waterspouts. At Tahoe City a remarkable display was recently observed. The attention of a fishing party at the outer end of a long pier was attracted by a loud roaring, and looking across the lake toward Glenbrook saw a hurricane approaching with a long wave or water swell, fifteen feet high in advance.

Knowing that this would sweep the whole line of the pier, all present beat a rapid retreat to the shore. When at a safe distance the party turned to gaze upon the incoming wall of water. While thus employed they were startled by a tremendous roaring to the northward, and a moment after a cyclone from that direction struck the lake. This sent before it a huge wave which had soon attained the height of that coming from the southward. In a few minutes the two waves came together. When they struck a column of water and spray was sent into the air to the height of at least 100 feet. The collision of the two waves was followed by a report that sounded like a heavy clap of thunder. A moment after this grand shock of the waters five or six huge waterspouts made their appearance, all within an area of three or four miles, and carried great columns of water and spray to the height of several hundreds of feet. These circled to and fro over the lake for some ten or fifteen minutes, and then one after the other subsided, and for a time thereafter there was almost a dead calm. Waterspouts are very frequently seen on the lake at this season. This is owing to the peculiar situation of the lake, under the crest of the main ridge of the Sierra Nevada range of mountains. When a fierce gale from the west crosses the ridge it plunges down the great cañons, and thus are brought to bear on the lake conflicting currents of air. When a hurricane is blowing from the west immense volumes of air appear to be dammed up and compressed behind the ridge of the Sierras, which at times escape and come over and down the gorges in tremendous puffs. No navigator of the ocean, remarks the *Virginia* (Nev.) *Enterprise*, sees half as many waterspouts in a three years' voyage as are seen by persons residing at Lake Tahoe in a single season.

* From the *American Chemical Review*.

The Connellsville Coke Industry.

The Pittsburg *Manufacturer* has obtained from parties interested in the Connellsville (Pa.) coke industry the following facts respecting the magnitude of the business of that district. The 8,000 coke ovens of the district have a daily producing capacity of 15,000 net tons.

The most of the coke goes to the West and Northwest. Some of the most distant markets to which it is shipped are: Colorado, Utah, New Mexico, and Arizona. Freight charges to these points range from $20.00 to $45.00 per net ton. It is mostly used in iron making blast furnaces, and in the far west for smelting the precious metals, etc., but it is also largely used in foundries and other works. Its chief distinguishing merits are its high percentage of carbon, its freedom from impurities, and its hardness and consequent ability to bear a heavy burden in the furnace. Following is an analysis of Connellsville coke: Water at 225°, 0·030; volatile matter, 0·460; fixed carbon, 89·576; sulphur, 0·821; ash, 9·113.

The most amazing feature of this industry is the enormous waste of gas it involves, and of the by-products that would be got were the gas saved and purified.

The Color of Water.

Experiments made by J. Aitken confirm the usual notion that pure water has a blue tint; but he finds that the theory of selective reflection is insufficient to account for all the variations as to tint met with in the case of natural accumulations of water. Whitish particles are suspended in the water of the Mediterranean, and the tint varies from deep blue to chalky blue-green, according to the proportion in which these particles may be present.

Forests and Climate.

A paper has been prepared by Dr. Schomburgk, the Director of the Botanical Gardens at Adelaide, on the influence of forests on climate. The object of the author is to prove that the destruction of forests usually has the effect of reducing the rainfall, while, on the contrary, the planting of trees broadcast over a country is one of the best methods which can be adopted for ameliorating its climate and increasing the annual fall of rain. It cannot, indeed, be proved that the climate of South Australia is altering for the worse in this respect. In fact, a comparison of the meteorological records will show that the annual average rainfall for the colony during the past ten years has been 21·1 inches, as compared with 20·1 inches for the previous ten years. The fact is, that in the agricultural districts of the colony, and especially in those which were not originally timbered, the bringing of the land into cultivation has had the effect of slightly favoring the fall of rain. Plowed land attracts moisture to a much greater degree than the unbroken soil. In considering the effect which the removal of forests *per se* has in altering the climate in South Australia, the only direct test that could be taken from the records issued by the Government Astronomer is the experience of the neighborhood of Adelaide. If the time is divided which has elapsed since 1839, the year in which observations were commenced, into two periods, there is found for the first an average rainfall of 22·8 inches, and for the second one of 21·7 inches. It will thus be seen that, on the whole, the rainfall at Adelaide is diminishing, though very slightly, and perhaps the diminution in the amount of timber may have something to do with the change. Dr. Schomburgk, in searching for illustrations of the effect of trees on climate, goes further afield, and brings forward some striking instances, in which it is evident that loss of forests means loss of rain fall, and *vice versa*. He recalls how the Russians, by burning down some of the Transcaucasian forests at the time of the struggle with the Circassians, converted the country from a fertile land into a desert, simply through the cutting off of the supply of rain. Similar instances of rain having deserted a country denuded of forests have occurred in the Mauritius, in Jamaica, the Azores, and, it may also be added, to a still more remarkable extent in several of the smaller West India islands. No sooner had the forests of these places been destroyed than the springs and rivulets ceased to flow, the rainfall became irregular, and even the deposition of dew was almost entirely checked. On the other hand, it is generally accepted as a fact that Mehemet Ali increased the fertility of Egypt enormously by planting trees. He alone planted some 20,000,000 on the Delta; his successors followed up the work, and it is a noteworthy circumstance that the rainfall rose from 6 inches to 40 inches. Planting has also, it would seem, produced remarkable effects in France and Algiers. Extensive regions have been planted with gums and other trees, which, for the most part, grew to about 30 feet or 40 feet in height, and it is noticed that the quantities of rain and dew which now fall on the adjacent land are double what they formerly were.—*Architect.*

Operations in Rubber.

Within a short time the price of Para rubber has risen from 95 cents to $1.25 a pound, making the price the highest ever reached in this city, and nearly double what it was two years ago—the result, it is said, of a corner by a few great operators. Most of the supply is held in Europe, though two-thirds of the rubber produced is worked up by American factories.

A meeting of seventy rubber manufacturers, representing capital to the amount of $30,000,000, and over 60 firms employing from 15,000 to 25,000 hands, was held in this city, October 19, to devise means for defeating the corner. One of the means proposed was a general stoppage of work; another the formation of a purchasing bureau at Para. With the exception of a single company all the rubber firms of the country have entered into an agreement, by the terms of which the packing, hose, and belting makers were to reduce the production 25 per cent. after the first of this month, and the manufacturers of shoes and clothing are to shut down altogether after the 23d of December, that condition to continue until such time as the price of rubber warrants resumption.

The corner is confined to the high grade Para rubber, and has nothing to do with the common grade of Central American, Bornean, and African rubber. The cheap grades have, however, advanced fully fifty per cent in price, throughl sympathy. The stock of rubber in this city and Boston, it is said, is practically exhausted, and none is expected unti the arrival of three ships from Para about Nov. 1. Some of the manufacturers find themselves embarrassed by the situation, while others, who have large stocks of crude rubber on hand, find it very profitable. In Para there about 150 receivers of rubber who control the negroes who gather the gum. These receivers sell their stock to eight shippers, and several of these shippers are controlled by the corner.

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Weeds and their Seeds.

In a recent experiment station bulletin, Dr. E. L. Sturtevant gives the following facts, as reported in the Albany *Cultivator:*

Weeds, however, show a most remarkable fecundity. It becomes impossible to select an average plant, as the growth varies so much in localities. We have, however, selected plants representing vigorous plants, and the average plant of our fields. The number of species of weeds upon the station farm is quite large, and the number which can start on a limited area is very surprising. June 22, a single square foot of ground in our pear orchard, that had been plowed and harrowed this season, was found to contain 356 growing plants, comprising 7 distinct species, not counting grasses or clovers. At the same date our forage plat contained 24 species of weeds, our lawn 13 species, our fields 30 species, and our garden 23 species.

On September 28, one vigorous purseley plant (*Portulaca oleracea*) contained 9 branches, the average branch 15 branchlets, the average branchlet 212 seed capsules, one average seed capsule 75 seeds, thus making for an estimate a grand total of 2,146,500 seeds.

June 21, an average plant of shepherd's purse (*Capsella bursa-pastoris*) contained about 1,000 pods, each pod at least 20 seeds, and more blooms to come. A better specimen showed 2,200 pods and still blooming; a vigorous specimen had 4,400 pods at least, and still blooming. The number of seeds to a plant may therefore be estimated at from 20,000 to 80,000. A fair sample of mallow (*Malva rotundifolia*) had 1,100 blossoms, and more to come, each bloom producing 15 seeds; the estimate for the plant, therefore, is 16,500.

A fair sample of chickweed (*Stellaria media*) showed 123 flowers and capsules, each of which produced from 7 to 10 seeds. A better plant showed 471 capsules, and many had opened and fallen. This plant flowers during a very long season, and the number of seeds upon the plant at one time may be safely estimated at from 1,000 to 4,000.

A plant of corn speedwell (*Veronica arvensis*) showed 43 pods with 90 seeds to a pod. A more vigorous plant showed 175 pods and about 101 seeds to a pod; another plant had 78 pods, and still another 123 pods. The number of seeds can therefore be estimated at from 4,000 to 15,000 to the plant. A specimen of the thyme-leaved speedwell (*Veronica serpyllifolia*) had 142 pods with about 58 seeds to the pod, or an estimated number of 8,000 seeds to the plant.

A fair, rather smallish plant of black mustard (*Sinapis nigra*) had about 120 blossoms and pods. One pod had 15 seeds; the estimate, therefore, is 1,800 seeds to the plant.

It does not require a very vigorous dandelion (*Taraxacum dens-leonis*) to throw up 10 or 20 blooms in a season, yet each head may contain 120 seeds or more, or from 1,000 to 2,000 to the plant.

A fair sample of curled dock (*Rumex crispus*) had 9 stems; one stem, selected as an average one, had 21 flower spikes, one average spike counted 369 blooms. A single stem had, therefore, about 7,750 blooms, and the nine stems about 69,000 blooms. A larger plant in the garden had ten stems. the largest stem had 41 seed spikes, the smallest 20 seed spikes, the largest spike had 630 whorls, the smallest 219 whorls. The computed number of seeds is therefore at least 93,390.

On July 1, a vigorous plant of corn cockle (*Lychnis githago*) had 60 pods and blossoms; 2 seed pods had 49 and 62 seeds respectively; the total number of seeds may therefore be computed at 3,300.

On June 25, an average flower of the ox eye daisy (*Leucanthemum vulgare*) contained 802, and another flower 859 akenes to the flower. One plant had 72, and another plant had 120 blooms. While often there is but one stem to a seed, yet frequently there are more, up even to 23. One stem may have 13 blooms. The number of seeds to a plant may therefore be computed at from 8,000 to 96,000 seeds.

On July 6, a fair stool of chess or cheat (*Bromus secalinus*) had 211 heads, and an average head had 18 seeds; the estimated number of seeds is 3,798.

A fair sample of corn chamomile (*Anthemis arvensis*) had 151 seeds to the flower, and 48 flowers to a stalk. This plant has from 1 to 10 stalks. The seeds can, therefore, be computed at from 7,000 to 70,000 to a plant.

On July 12, a vigorous plantain (*Plantago major*) had 8 flower spikes, and one of these, not the largest, had 561 blooms.

On August 29, an average sized plant of pigweed (*Chenopodium album*) had 28 branches. One branch bore 21 branchlets. One average branchlet bore 13 flower spikes. One average spike contained 108 seeds. The computation for the plant is, therefore, 825,552.

Sure Cure for Corns.

A. C., who has tried it, is authority for the following: Take one-fourth cup of strong vinegar, crumb finely into it some bread. Let stand half an hour, or until it softens into a good poultice. Then apply, on retiring at night. In the morning the soreness will be gone, and the corn can be picked out. If the corn is a very obstinate one, it may require two or more applications to effect a cure.

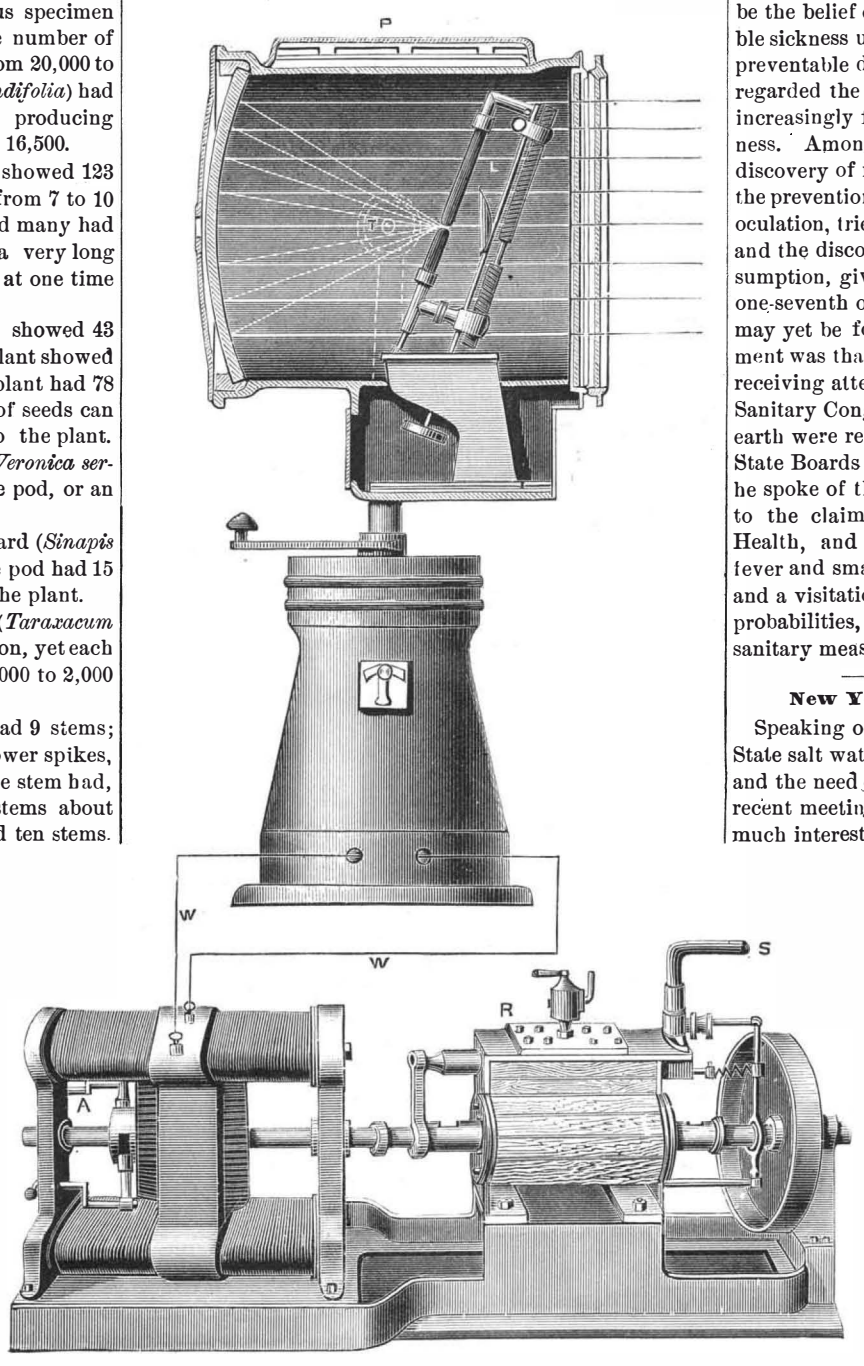
Trial of an Asbestos Fire Shield.

A test of an asbestos curtain or fire shield was made recently before members of the Washington Fire Board, and the police and fire departments. The curtain was hung between two posts. On one side of the curtain was a pile of kindling wood, and close on the other a frame of wood with a glazed window. When the kindling wood was fired the heat was so great that the spectators were driven back a distance of fifty feet. The flames curled against the curtain, but had no effect upon it or upon the window frame behind. The frame was not heated nor was the glass cracked, though both were within six inches of the fire, and separated from it only by the curtain.

The experiment was considered highly satisfactory. At the conclusion of the experiment the curtain was found to be unchanged and uninjured in the slightest degree. Even the smoke did not adhere to it. The shield is a fabric of asbestos millboard or sheathing covering fine wire, making one solid sheet, thus strengthening it to allow of its suspension from the upper part of a building, and hang down over the front to the ground, to protect it from exposure to fire.

NAVAL SEARCH ELECTRIC LIGHT.

The accompanying engraving explains itself. It illustrates one of eight projectors, or "search" lights, made by the British Electric Light Company, Heddon Street, W., for the Admiralty. According to the *Engineer*, no regulators are used, the carbons being kept in adjustment by hand as the beam of light is swung round the horizon. A is the Gramme dynamo machine; L is the hand lamp; R is Hodson's rotary engine; S is the steam pipe; P is the projector; W are the wires conveying current to lamp; T are the trunnions of projector.



NAVAL SEARCH ELECTRIC LIGHT.

Patent Law in Switzerland.

The proposed introduction of a patent law, which has been universally believed to be accepted, has met with a refusal by a public vote of the 30th of July. Switzerland and Holland are now the only countries in Europe which have no patent law. It must be acknowledged that the Swiss are not quite without reason in not accepting a patent law. Foreign patented, or non-patented, articles, in consequence of the low duties, meet with no difficulty in importation into Switzerland, while Swiss articles can, on account of the high protective duties, only in rare cases enter the neighboring countries. As long as these abnormal circumstances exist, Switzerland is not likely to give foreign products an additional protection by patents.—*Chem. Zeit.*

American Public Health Association.

The tenth annual session of the American Public Health Association began in Indianapolis, Ind., Oct. 17. In the annual address President R. C. Kedzie, of Lansing, Mich., reviewed some of the more striking lines of evidence to disprove the assertion that sanitary effort—though it prolongs life—does not really benefit the race. The truth is, life is not only lengthened but made more valuable and enjoyable by improvement in man's surroundings.

As the result of sanitary science he said the death rate in England has been decreased 12 per cent in urban and 8½ in rural districts. The number who survive youth by reaching the age of twenty has been increased 12 6/10 per cent during the last years, while the number of those who pass from twenty to thirty-five years has been increased 12 3/10 in the same period. Two hundred years ago in England, small pox, when it became prevalent, killed 96 out of every 1,000, and 66½ in Germany. Now the mortality from this cause is less than 1 in 1,000. Sanitary science has thus saved 95 deaths in every 1,000 in England, and 66½ in Germany, and such a visitation as the black death in Europe would never be known again until sanitary science became a thing unknown. The number of deaths from typhus had been reduced in England more than half, and the same was true of any other disease. Indeed it had, he said, come to be the belief of scientific and thoughtful men that preventable sickness unprevented is a crime against society, and that preventable death unprevented is a crime against God. He regarded the outlook for the progress of sanitary reform as increasingly favorable and giving much ground for hopefulness. Among the grounds of encouragement he cited the discovery of remedies for splenic fever in domestic animals, the prevention of disease by the extension of the method of inoculation, tried successfully upon animals, to the human race, and the discovery of the bacillus, which is the cause of consumption, giving hope that this dread disease, from which one-seventh of the deaths in the human family take place, may yet be found curable. Another ground of encouragement was that the question of public health was everywhere receiving attention, as was evidenced by the recent World's Sanitary Congress, where all the civilized nations of the earth were represented, and also the general organization of State Boards of Health. In alluding to discouragements, he spoke of the indifference of Congress and the Executive to the claims and importance of the National Board of Health, and argued that the present time, when yellow fever and small pox were both liable to become epidemic, and a visitation of Asiatic cholera was not among the improbabilities, was not a fit occasion for neglecting any sanitary measure that had hitherto been found beneficial.

New York State Salt Water Fish Hatchery.

Speaking of the slow progress made in establishing the State salt water fish hatchery at Cold Spring, Long Island, and the need of hurrying the work, Mr. Blackford said at a recent meeting of the State Commissioners of Fisheries, that much interest has been taken of late in the development of cod fisheries on the Long Island coast.

Already large numbers of cod were taken for the New York market in the fall and early winter months on the south coast from Coney Island to the point. Over twenty-five fishermen were engaged in taking them, besides many private boats. The commissioners could get codfish with little expense, and they would increase very rapidly. He also said that codfish were growing scarce rapidly along the New England coast. He thought the spawn of the Spanish mackerel could be obtained and the work of hatching carried on with success in the Long Island preserves. There had been expended in fixing up an old building for a hatchery at Cold Spring $178, and a few hatching troughs had been prepared. This was all that had been done. Commissioner Sherman was in favor of continuing the work at Cold Spring, but thought that it should go on in a moderate manner. He considered it an experiment as yet. The time was soon coming when the spawn of striped bass would be obtained in quantity, and this fish would become one of the most important in the markets, as it will live in both salt and fresh water. He thought special attention should be given to it. The spawn could be taken from the Potomac and other southern waters. In his opinion the hatchery, in time, would be of the greatest importance in raising striped bass. The fresh water ponds could be utilized for brook trout and landlocked salmon. The commissioners then decided to complete the work, and Commissioner Blackford was appointed a sub-committee to put in order the hatchery and hatch such fish spawn as the United States Commissioners and the hatchery at New Caledonia could furnish; also to build such salt water ponds as he thought advisable for the hatching of salt water fish, the expense for such purposes being limited to $1,000 until the further ordering of the Board of Commissioners.

THE census in the French colony of Algeria for 1882 gives a total population of 3,310,565. This shows an increase since 1876 of 442,939. Of the total number given, 233,937 are French and 2,861,019 Mussulman natives. The rest are made up of naturalized Jews and foreigners.

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Correspondence.

The Copyright Law Amendment.

To the Editor of the Scientific American:

Allow me to call your attention to some errors in your article of October 21, entitled "A Dubious Amendment of the Copyright Law."

The act was introduced into the Senate by Mr. Hoar, early in April, and a few days earlier a duplicate of the bill was introduced in the House by Mr. Ranney.

The Library Committee desired, on consultation, that it be referred to the patent committees, and it was so referred.

A hearing was had before each committee. It was explained that there was no intention to make anything copyrightable that was not already copyrightable as a "model or design intended to be perfected as a work of the fine arts." R. S., § 4952.

Such things were illustrated by the Matsys wrought iron, the Berlin cast iron, the Parisian bronzes, the Sevres, Dresden, Della Robbia, Limoges, Louzmy, Muiton, and Copeland potteries and faiences, the Cebbini repousse work, Palissy and Henri III. ware—confessedly works of the fine arts under any definition.

Attention was called to the artistic products of this country in faience, iron, bronze, brass, silver, and plate, by which the houses and households of the country may be and are made beautiful at small cost, and which have been largely imitated abroad in inferior material and execution and sent to this country; and the committee were shown that copyright protection had been taken on many American designs, but that the requirements about marking had resulted either in disfiguring the goods or that the requisite finish destroyed the marks; and further, that the place where customers and experts looked for marks was on the back or bottom.

It was also explained, and the able lawyers of the committee readily saw, that it was intended simply to change the place of marking copyrightable articles. The question of fact, What is a work of the fine arts? would remain where it was before.

It was argued and conceded that all things upon which labor and expense have been bestowed, unnecessary to prepare them for service, but solely to improve their appearance, are broadly to be considered as "works of the fine arts." Modeling, sculpture, carving, architecture, engraving on wood or metal, lithography, painting, printing, bookbinding, cabinet work, inlaying, repousse, enameling, have always been held to be "fine" as distinguished from "industrial" arts, and works of these sorts are subjects of copyright just as music and prints are.

The difference between copyright and design patent for these things has been heretofore, and now is, this: If the work has been published, the author or proprietor can obtain only fourteen years' protection at most under the patent laws. If it is unpublished, he can obtain copyright protection for twenty-eight years with right of renewal. He can take ten copyrights at least for the cost of one patent. Formerly the law gave advantage to the patentee in the matter of marking his goods. Now the patentee and copyrighters are on the same footing in this regard.

The introduction of the bill was noticed largely in the papers, the hearings before the committees were spoken of, the leading artists, art manufacturers, and dealers took a lively interest in the measure, and corresponded with congressmen about it. The Senate passed it unanimously. The House suspended the rules at the request of Messrs. Ranney and Ritchie, and with the advocacy of Mr. Cox to allow it to be reported and passed, and probably it was as fully understood as any measure ever before Congress.

But it must always be remembered that the privilege of adjudication on what is and what is not "fine arts" is vested in the Federal Judiciary and nowhere else, and that a postmaster's receipt is as good proof of entry for copyright as the librarian's certificate (R. S. §§ 4956, 4961), so that an assumption of judicial forms by a recording officer in refusing to record can hurt no one but himself. The only *quasi* judicial authority of the Librarian of Congress is under ch. 301, acts of 1874. He may refuse registration of a print or engraving which is *not* a pictorial illustration or work connected with the fine arts, and prints or labels designed to be used in connection with other articles of manufacture go to the Patent Office. THOS. WM. CLARKE.

Boston, October 24, 1882.

Notwithstanding our correspondent's explanation, the meaning of the law in question remains uncertain. It fixes clearly enough the place for putting the copyright mark on objects subject to copyright; but at the same it enumerates, as copyrightable articles, a class of objects not clearly made "subject to copyright" by this or any previous act of Congress. The act reads as follows:

An Act to amend the statutes in relation to copyright.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That manufacturers of designs for moulded decorative articles, tiles, plaques, or articles of pottery or metal subject to copyright may put the copyright mark prescribed by section forty-nine hundred and sixty-two of the Revised Statutes, and acts additional thereto, upon the back or bottom of such articles, or in such other place upon them as it has heretofore been usual for manufacturers of such articles to employ for the placing of manufacturers', merchants', and trade marks thereon.

Approved, August 1, 1882.

The foregoing is ostensibly intended to obviate certain disadvantages arising from the requirement of the act of June 18, 1874, that (except in the case of books) the copyright mark should be put upon some "visible portion" of the object copyrighted, that is, "if a map, chart, musical composition, print, cut, engraving, painting, drawing, chromo, statue, statuary, or model or design intended to be perfected and completed as a work of the fine arts."

The wording of the act approved last August makes presumptively copyrightable a class of articles not hitherto considered as "works of the fine arts," and now its advocates claim that the Librarian of Congress transcends his functions in declining to accept their extension of the meaning of the term. It seems to us that until the Federal judiciary has decided the question in dispute the librarian cannot well do otherwise than abide by the established usage of the English language, which limits the term "fine art" to works designed wholly for ornamental or æsthetic purposes, excluding those primarily intended for use, however elaborately beautiful.

Our correspondent says: "It was argued and conceded that all things upon which labor and expense have been bestowed, unnecessary to prepare them for service, but solely to improve their appearance, are broadly to be considered as 'works of the fine arts.'"

Under this definition every piece of figured crockery, every embroidered collar or slipper, every striped or otherwise decorated plow or wheelbarrow, in short nearly every article of apparel, machine, tool, household utensil, or other product of the industrial arts, is a work of fine arts, since they have had labor bestowed upon them solely to improve their appearance.

In that it is the basis of a claim for copyright for this new order of "fine arts," the law in dispute may well be called dubious.

It remains for the courts, not for the Librarian of Congress, to say that a new meaning shall be given to an old word in the interpretation of statute law.

A Whale Snaps a Log Line.

To the Editor of the Scientific American:

The following may be of interest to the readers of your valuable paper:

On the writer's last voyage from Baltimore to Rio de Janeiro, via Pernambuco, his attention was called to a large whale leisurely floating on the water near the stern of the vessel. All at once he seemed possessed with a spirit of frolic, diving and coming to the surface with the most playful motions. As his huge head descended he would slowly expose his tail, until for several seconds it remained erect on the water.

I chanced to have one of Messrs. John Bliss & Co.'s logs in use, the line and rotator towing astern. Never in thirty years' of sea experience did I see or hear of a whale biting anything, but to my surprise he took the rotator of that log in his mouth. Immediately my mate and a passenger, in order to save the indicator, seized the line, which quickly snapped in their hands, and was drawn off by the whale, who wound it round and round his head and tail until he appeared completely bewildered. This incident occurred in lat. 10° 5′ south, long. 38° 11′ west.

I would advise all ship masters to haul in their line and rotator when whales are about or they may lose them as did your obedient servant,

JOHN T. HOLT,
Master of ship David Stewart.

Ship David Stewart, at Sea, Sept. 9, 1882.

Comets.

To the Editor of the Scientific American:

The following theory of comets is submitted to the consideration of those who can either prove or disprove its correctness.

A comet consists of a nucleus and an atmosphere, for the most part invisible, extending around it in every direction as far at least as the so-called tail reaches. The sun's rays in passing near or through the nucleus are so modified as to render visible a part of the cometic atmosphere opposite the sun. When the nucleus approaches the sun with the *tail* behind it, and passing around the sun appears with the *tail* before it, there has been no swift changing of *tail*, but merely different portions (or radii) of the cometic atmosphere have been made visible.

Whenever the nucleus approaches near the sun the latter is enveloped in the cometic atmosphere, and abstracts from it whatever is necessary for its use.

Should this theory be correct the earth must have passed through the atmospheres of many comets, which have produced no greater effect on it than the zodiacal lights have done. FURMAN LEAMING, M.D.

Romney, Indiana, October 21, 1882.

The Elevated Steam Roads, New York City.

The *Elevated Railway Journal* says: "The correct traffic figures of the Manhattan Railway Company for the twelve months ending September 30 show that during the year 86,361,029 paying passengers were carried over the line. This gives a monthly average of 7,196,769, and a weekly average of 1,660,789. Divide the year's traffic by days, and we have 237,253, which, if all the lines were operated continuously, day and night, would give an hourly average throughout the year of 9,869. But the lines are not all operated continuously, two of the four being closed at night and on Sundays; and then, too, the elevated roads have their dull seasons and their busy ones, just as surface roads have. This is well illustrated in the reports for May and July. In the former month, 7,920,875 passengers were carried, while in the latter there were but 6,637,137, a falling off of 1,283,738. Again, although the daily average for the year was 237,253, the days' traffic taken separately differ as widely as that of months. The heaviest travel of a single day within the year just closed was on April 11, when the report shows 319,138. On December 31, 304,183 passengers were carried; on May 30, 296,808, and on December 23, 296,560.

"But the distribution of the travel throughout the twenty-four hours of the day is, of course, still more uneven. As we have said, two of the four lines are closed at night (from 8 P.M. to 5:30 A.M.), and the two that are kept open have but few passengers after midnight. There are three hours in the morning and three in the evening known as commission hours, when the fare is but five cents, and in these six hours 65 per cent of the entire traffic is handled. Taking the daily average, then, as a basis of calculation, and dividing it according to this percentage, we have 154,212 as the average per diem for the six commission hours, or nearly 26,000 an hour; and if we had any means of ascertaining the exact traffic per hour, the results would show an average for the hours between 6:30 and 7:30 A.M., and 5:30 and 6:30 P.M. fully double this. We know that these figures must strike many of our own citizens, even, as fabulous, but they are compiled from the daily traffic slips of the company, and these are made up from the actual number of tickets collected from the canceling boxes.

"The year's travel, divided by the mileage of the entire system, shows an average number of passengers per mile of 2,698,782 for the twelve months, a monthly average travel per mile of 258,232, and a daily average of 8,608. This, of course, was as unequally distributed as the hourly travel, but we have no means of computing it further. The traffic of the roads for the preceding year, which closed September 30, 1881, was 75,575,245, and for the twelve months ending on the corresponding date, 1880, 60,831,759. The travel of the year just closed exceeds that of its immediate predecessor by 10,785,784, and that of 1880 by 26,529,270 passengers."

Direct Positives.

A gelatine plate is exposed in the camera about double the ordinary period, and then developed in the usual way with ferrous oxalate. The development is continued, indeed, until the back of the plate is completely black. About ten to twelve minutes are generally required to bring about this result.

The plate is now perfectly black on both sides. A two per cent solution of chromic acid, or a solution of one gramme of bichromate of potash and five grammes of nitric acid in one hundred grammes of water, is then poured over the unfixed plate until the black color has disappeared, and a bright image composed of pure chromate of silver is produced.

The plate is then further treated in daylight. To remove all the chromate of silver, it is washed with very dilute ammonia, say one part of the latter mixed with one hundred parts of water.

Finally, the plate is again laid in an oxalate developer, and this is permitted to act until the desired vigor is obtained. If the plate gets too vigorous, the action of the developer is at once suspended, and the image is washed and fixed. An emulsion poor in gelatine is employed; if there is much gelatine in the film, the manifold operations to which the plate is subjected naturally enough lead to difficulties, such as frilling, creasing, etc., of the film. In fact, the great thing is to work with a film containing as little gelatine as possible.

At the last meeting of the Berlin Society for the advancement of photography, a number of plates produced by this process were submitted to the meeting, and invoked universal admiration. It was then remarked that the method was an improvement of Jaehn's plan of producing direct positives, which, our readers may remember, we published in these columns about two years ago. It is very frequently of importance to secure a negative direct in the camera, from another negative, especially in the case of enlargements, and this new method affords an easy plan of doing so.—*Herr Obernetter, in Mittheilungen.*

EVERY corpse that is taken to the Paris Morgue is now quickly converted into a block almost as hard as stone. This result is obtained by Carré's chemical refrigerator, which is capable of reducing the temperature of the conservatory, where each body is laid out on something closely resembling a camp bedstead in stone, to 15° below zero centigrade. At the back of this room is a row of stove like compartments, in which the corpses are boxed up and frozen hard before being exposed to public view. As an illustration of the intense cold thus artificially secured, a Paris journalist, in describing a recent visit to the Morgue, says that in opening one of the compartments the attendant took the precaution to wear a glove, lest "his hand should be burnt by contact with the cold iron." The corpse which was taken out of its receptacle had been there nine hours. The doctor who accompanied the visitor struck the dead man on the breast with a stick, and the sound was just as if he had struck a stone.

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NATURAL HISTORY NOTES.

Electric Phenomena in Plants.—Some interesting results have been obtained by A. J. Kunkel concerning the various electric phenomena observed in plants. He finds that the leaf veins are generally positive toward the rest of the leaf, but the direction of the current is reversed if the spot on the leaf where the electrode is placed is wetted before the other electrode is placed on the vein. A spot long moistened is positive toward one freshly wetted. When a plant is bent or wounded, the electrode near the bend or wound is negative to the other. Dr. J. Burdon Sanderson has noticed somewhat similar phenomena in the leaf of the Venus's fly trap (*Dionœa muscipula*), the under surface of the sensitive lobe of the leaf being electro-negative to the upper at the moment that the leaf is irritated; after about half a second the upper surface becomes electro-negative and remains so for some time.

Cross-fertilization of Flowers by Insects.—In his translation of Darwin's work on cross-fertilization Mr. Haeckel takes occasion in a foot note to urge, as a decisive argument against the cross-fertilization of flowers by insects, the fact that the latter are absent from, or at least are extremely rare on, the flowery summits of high mountains. Mr. C. Musset, after four years' observations at Grenoble, in the center of a region having all altitudes from 200 to 3,000 meters, and amidst one of the richest herbaceous floras in the world, has presented a note to the French Academy (*Comptes Rendus*, xcv., 6) in which he fully confirms the view of Darwin and shows that Haeckel's objection is not well founded. He affirms, as the result of manifold observations of his own, supported by the testimony of several distinguished botanists and entomologists of the region, that all orders of insects are represented up to a height of 2,300 meters; that above that altitude Lepidoptera, Diptera, and certain Hymenoptera are more numerous than other orders; that the number of genera, species, and individuals of nectarophilous insects is proportional to that of the flowers, and is sometimes incalculable; that the hours of opening and closing of nyctitropic flowers is synchronous with the awakening and sleeping of insects; and that the apparent number of nectarophilous insects is physically and physiologically related to the number of their favorite flowers, and to the state of the atmosphere and sky.

The Color Sense in Crustaceans.—Mr. C. De Merejkowsky, following Sir John Lubbock's investigations into the perception of color by the lower animals, has experimented upon Crustacea, especially larvæ of Cirripedes and a Copepod. In darkness, the animals disperse to all sides of the vessel in which they are kept. If daylight is admitted through a slit, they congregate near the latter, and behave similarly toward monochromatic light of whatever color. Using two slits at an angle of 40° with each other, and admitting white light by one, and a monochromatic light by another, he finds that most, if not all, prefer the white light; but pale colors (yellow, green, pale red) also attract a few individuals. When two monochromatic lights are used, the brighter is preferred; with two rays of equal brightness the animals are equally divided between the two. Any superiority in the amount of light admitted attracts the bulk of the colony, whether the light is monochromatic or not. Thus it is seen that these animals appreciate only the quantity of light, or the intensity of the vibrations which produce it, and are only sensitive to color as implying a certain amount of light.

The Latent Vitality of Seeds.—Some preliminary experiments have been made by Messrs. P. Van Tieghem and Gaston Bonnier, says the *Gardeners' Chronicle*, to ascertain the effects of different conditions on the latent vitality of seeds. On January 9, 1880, several packets of seeds were divided each into three equal parts. One portion was exposed to the free air, but secured from dust; another portion was put into closed air, securely corked up in a tube; while a third was placed in pure carbonic acid. At the end of two years the seeds were taken out and weighed, and afterward sown. As regards weight, all the seeds exposed to free air showed an increase. Thus, for example, fifty seeds of the common pea were found to have increased about $\frac{1}{73}$ of their original weight; and fifty seeds of the French bean, about $\frac{1}{56}$ of their original weight. The seeds confined in closed air increased in weight, but infinitely less so than those exposed to free air; and the increase in some instances was so trifling as to be hardly measurable. Thus, fifty peas increased about $\frac{1}{760}$ of their original weight, and fifty beans about $\frac{1}{1180}$ of their original weight. As for the seeds placed in carbonic acid, they did not vary half a milligramme from their original weight. The following are two examples of the comparative germination of the seeds, the conditions being as near as possible exactly the same:

Peas left in the	free air,	90 per cent germinated.
"	closed air,	45 per cent germinated.
"	carbonic acid,	0 per cent germinated.
Beans	free air,	98 per cent germinated.
"	closed air,	2 per cent germinated.
"	carbonic acid,	0 per cent germinated.

The Woodcock Carrying its Young.—Professor F. L. Harvey, of Fayetteville, Ark., states in the *American Naturalist* that while out hunting, April 1, a woodcock (*Phitohelia minor*) was flushed by him from a clump of persimmon trees on the border of a slash. Knowing that the bird has the habit of rising above a clump of bushes and then suddenly dropping behind it out of range, he fired as soon as it rose in view. When the smoke cleared away the bird was observed rising with a labored flight, and, after reaching about a rod in height, turned and flew near Professor Harvey, who then observed that it was holding something heavy between its feet. The object on closer examination proved to be a young chick, recently hatched, which was located between the mother's legs and supported by her feet placed on its sides. So slow was the flight that by taking a brisk trot the observer was able to gain on the bird, which he endeavored to tire out and make drop its burden, but in this he was unsuccessful.

Enamels.

An enamel is a vitreous opaque colored material, tractable in the fire, and used in ornamenting metals; in painting on metals to be subsequently fired.

Enameled bricks of various colors—blue, red, white, yellow, and black—are abundant in some of the mounds of Babylon and other cities in Mesopotamia.

Enameled pottery has also been recovered at Thebes. Vestiges of the Roman occupation of Britain are occasionally disinterred in various parts of the country.

The art of painting in enamel or with metalline colors, and fixing them with fire, was practiced by the Egyptians and Etruscans on pottery, and passed from them to the Greeks and Romans. Enameling was also practiced by the Chinese. Enameled work is yet extant of early British, Saxon, and Norman manufacture. An enameled jewel, made by order of Alfred the Great, A.D. 887, was discovered in Somersetshire, England, and is preserved at Oxford. An enameled gold cup was presented by King John to the Corporation of Lynn, Norfolk, and is yet preserved.

Luca della Robbia, born about 1410, applied tin enamel to pottery and excelled in the art.

Bernard Palissy, the Huguenot potter, born about 1500, devoted many years to the discovery and application of enamels of various colors to pottery. He was remarkably successful in true copies of natural objects. He died in 1589, in prison.

John Petitot, of Geneva (1607–91), is regarded as one of the first to excel in portraits. He worked for Charles I. of England, and subsequently for Louis XIV. of France. The revocation of the Edict of Nantes drove him from France to the city of his birth, Geneva.

In 1632 Jean Toutin, of Chateaudun, introduced the practice of grinding the colors in oil of spike, instead of water.

Though the term enameling is usually applied to the ornamental glazing of metallic surfaces, it strictly applies to the glazing of pottery and porcelain, the difference being only that in the latter the surface is of baked clay.

Enamel is applied to various kinds of pots and pans for stewing and preserving fruits whose flavor would be injured by contact with iron, and wholesomeness by being cooked in vessels of brass or copper.

The ordinary enamel for the purpose is common glass fused with oxide of lead. This will not resist vinegar and some other acids, and a dangerous poison may be present unsuspected in a mess cooked in vessels glazed with such composition.

Articles exposed to the weather are sometimes enameled to preserve them from rusting. This has been done with plowshares, mould boards, water wheels, etc.

The asphaltum varnish which is burned on to some articles of hardware and household furnishing is not an enamel, but a bituminous varnish. The term enamel, as applied to these, is therefore a misnomer.

One of the most familiar examples of enameling is a watch face. The white ground of these is first fired, the figures being added afterward. The backs of gold watches and numerous articles of jewelry are enameled by first engraving them so as to make depressions to hold the pulverized enamel, which is burned in, and the whole polished down to a uniform surface. Enameled work may be ground by the horizontal lapidary mill or lead wheel, with emery; second, the same with rottenstone and water; third, polished by the leather lap or buff wheel with putty powder. Or the process may be completed in a lathe, using the same materials, and either chucking the object to be ground and polished, or placing it on a mandrel. In hand polishing the work is roughed down with slips of water-of-Ayr stone and water, followed by slips of wood dipped in powder of pumice stone and crocus successively.

Cardboard is treated with a surface of white lead and size laid on by a round badger's hair brush. A powder of talc (silicate of magnesia) is rubbed upon the dried surface of the lead, and the face is then polished by the brush.

The enameling of hollow-ware is by a mixture of powdered glass, borax, and carbonate of soda, mixed, fused, cooled, and ground. The ware is cleaned with acid, wetted with gum water, the powder dusted on, and then fused by heat carefully applied.

In enameling articles of pottery and glass, the colors are prepared from the oxides of different metals, melted with a vitreous flux and laid on with a fine brush; the medium being oil of spike, or some other essential oil. The work is heated in a muffle, which fuses the colors so that they adhere to the object. The principal colors are oxide of lead, platinum, chromium, uranium. Oxides of tin and antimony give opacity.

The enameler works, not with actual colors, but with materials which will assume certain colors under the action of fire.

For vitrifying the enamel coating on an article the work is placed in a muffle, which consists of an arched chamber in the midst of a small furnace, and surrounded by fuel, which keeps it at a red heat, although the fuel cannot touch the work. The furnace and muffle are sometimes made of sheet iron mounted on legs so as to bring the work on a level with the artist's eye.

Paper is sometimes enameled. Various metallic pigments are employed, such as will spread smoothly and take a polish. The pigments are white lead, oxide of zinc, sulphate of barytes, china clay, whiting, chalk, in a menstruum or upon a previous coating of glycerine, size, collodion, water, varnish, etc., afterward polished by an agate or between calendering or burnishing cylinders.—*Glassware Reporter.*

The Collection of American Woods at the Central Park Museum.

The Directors of the American Museum of Natural History are now preparing for exhibition in the Arsenal building, in Central Park, one of the finest collections of native woods ever brought together When rendered complete by the addition of 26 specimens that are expected to arrive before winter sets in, the collection will embrace specimen-blocks from each of the 420 trees indigenous to this country, and most of which have some economic or commercial value. As is usual in collections of this kind, each specimen-block is sawn longitudinally, diagonally, and transversely, so as to show the characteristics of the wood.

Among the many curious specimens in the collection now being prepared for exhibition, says the *New York Times*, one which will excite the greatest curiosity is a specimen of the honey locust, which was brought here from Missouri. The bark is covered with a growth of thorns from one to four inches in length, sharp as needles, and growing at irregular intervals. The specimen arrived here in perfect condition, but in order that it might be transported without injury, it had to be suspended from the roof of a box car, and thus make its trip from Southern Missouri to this city without change. Another strange specimen in the novel collection is a portion of the Yucca tree, an abnormal growth of the lily family. The trunk, about two feet in diameter, is a spongy mass, not susceptible of treatment to which the other specimens are subjected. Its bark is an irregular, stringy, knotted mass, with porcupine-quill-like leaves springing out in place of the limbs that grow from all well-regulated trees. One specimen of the Yucca was sent to the museum two years ago, and though the roots and top of the tree were sawn off, shoots sprang out and a number of the handsome flowers appeared. The tree was supposed to be dead and thoroughly seasoned by this fall, but now, when the workmen are ready to prepare it for exhibition, it has shown new life, new shoots have appeared, and two tufts of green now decorate the otherwise dry and withered log, and the Yucca promises to bloom again before the winter is over. One of the most perfect specimens of the Douglass spruce ever seen is in the collection, and is a decided curiosity. It is a recent arrival from the Rocky Mountains. Its bark, two inches or more in thickness, is perforated with holes reaching to the sapwood. Many of these contain acorns, or the remains of acorns, which have been stored there by provident woodpeckers, who dug the holes in the bark and there stored their winter supply of food. The oldest specimen in the collection is a section of the *Picea engelmanni*, a species of spruce growing in the Rocky Mountains at a considerable elevation above the sea. The specimen is twenty-four inches in diameter, and the concentric circles show its age to be 410 years. The wood much resembles the black spruce, and is the most valuable of the Rocky Mountain growths. A specimen of the nut pine, whose nuts are used for food by the Indians, is only fifteen inches in diameter, and yet its life lines show its age to be 369 years. The largest specimen yet received is a section of the white ash, which is forty-six inches in diameter and 182 years old. The next largest specimen is a section of the *Platanus occidentalis*, variously known in commerce as the sycamore, button-wood, or plane tree, which is forty-two inches in diameter and only 171 years of age. Specimens of the red-wood tree of California are now on their way to this city from the Yosemite Valley. One specimen, though a small one, measures five feet in diameter and shows the character of the wood. A specimen of the enormous growths of this tree was not secured because of the impossibility of transportation, and the fact that there would be no room in the museum for the storage of such a specimen, for the diameter of the largest tree of the class is thirty-five feet and eight inches, which represents a circumference of about one hundred and ten feet. Then, too, the Californians object to have the giant trees cut down for commercial, scientific, or any other purposes.

To accompany these specimens of the woods of America, Mr. Morris K. Jesup, who has paid all the expense incurred in the collection of specimens, is having prepared as an accompanying portion of the exhibition water-color drawings representing the actual size, color, and appearance of the fruit, foliage, and flowers of the various trees. Their commercial products, as far as they can be obtained, will also be exhibited, as, for instance, in the case of the long leaved pine, the tar, resin, and pitch, for which it is especially valued. Then, too, in a herbarium the fruits, leaves, and flowers are preserved as nearly as possible in their natural state. When the collection is ready for public view next spring it will be not only the largest, but the only complete one of its kind in the country. There is nothing like it in the world, as far as is known; certainly not in the royal museums of England, France, or Germany.

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The Use of Slate in Breweries.

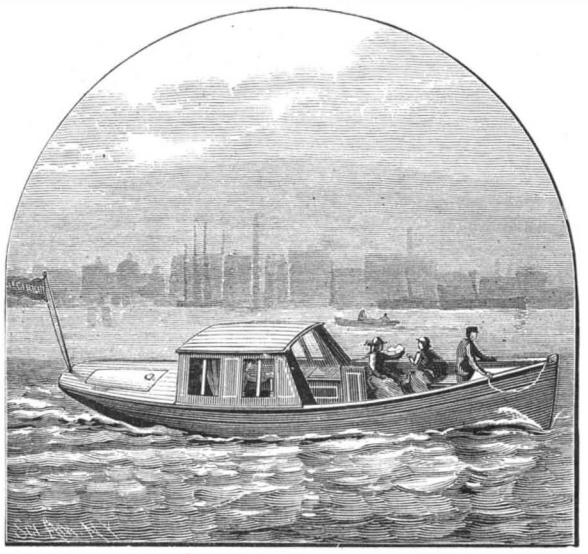
The paramount importance of keeping the brewery utensils perfectly clean, says the *Brewers' Guardian*, is one of the first points impressed upon the student of practical brewing, and during the fermentation stages of the process this is an essential element of success. The researches of Pasteur and others have shown us that myriads of minute organisms develop and multiply if they only find a suitable dwelling-place, and brewers are continually experiencing the ill effects produced by the growth and propagation of these so-called disease-ferments. The porous, internal surface of a wooden fermenting vat, with its numerous joints and fissures, is admirably adapted for harboring these little organisms, and if a little of the deposit which always collects in the cavities of a wooden fermenting tun were examined under the microscope, the brewer would probably be alarmed at what would be revealed to his sight. Continental brewers are fully alive to this danger, and scarcely ever use a vat or a cask without previously coating it with a complete layer of pitch, so that a perfectly smooth and polished surface is exposed to the wort and beer, and there are no places on which a deposit can rest. In this country we still continue to use unprotected wood for brewing utensils, chiefly on account of the economy of this material. From time to time fermenting tuns made of other materials than wood have been suggested, but, except in Yorkshire, where stone squares are largely employed, slate is the only material which has as yet been substituted for wood. We can scarcely imagine a more perfect material for a fermenting tun than slate; it is easily worked into a smooth surface, it is non-porous, and slabs of it are easily jointed together. When empty the tun can be readily cleaned, so that not a single organism need be left upon its surface. The objections raised to slate are that it is more expensive, and that it conducts heat more readily than wood. With regard to the latter objection we do not consider it a very serious one, for although it is true that slate is a comparatively good conductor of heat, and vessels made of it acquire the temperature of the surrounding air more rapidly than those of wood, we think that with all our modern appliances for attemperating, this slight drawback can be easily overcome. The question of expense is more serious, for the first cost of a slate tun is undoubtedly higher than that made of wood, but in the end the former is really the cheaper material, for, once erected, it will last for ever, while wooden tuns require occasional repairs, and in course of time become unfit for use. We should like to see the use of slate become more general in our breweries, not only for fermenting tuns, but for cleansing vessels, stillions, and other utensils. Its advantages as regards cleanliness are so great that any extra outlay at first is soon repaid.

Micrographic Study of Dyed Silks.

The microscopic examination of dyed silks is extremely interesting. If the fiber is seen lengthwise on the stage of the microscope it appears uniformly dyed, and offers otherwise nothing particular. It is not the same with sections of the fiber seen endwise. It is found on examination in this manner that the center of the silk is rarely dyed; that the dye forms a concentric ring, the depth of which ordinarily diminishes gradually from the circumference toward the center. The observations made by M. Lembert establish also that if we dye silk with a simple color, such as cochineal, weld, etc., the color penetrates in time more and more toward the center of the silk, becoming at the same time deeper and deeper, so that if we take successive specimens from a lot of yarn during dyeing, they will exhibit under the microscope rings of color which become broader and broader till they reach the center. If a silk dyed a light shade of one color is plunged into a bath of a second color and dyed to saturation, the section will show under the microscope an outer ring, of which the color is a result of the two dyes employed, and an inner part having the pure tone of the second dye. Reciprocally, if we plunge a silk dyed to saturation with one color into a second color, but without saturating it, with the microscope we perceive an outer ring, which is the result of the two colors and the central part of the primitive shades. Silk plunged in a beck of nitrate of iron becomes in time saturated to the center, and after being washed and soaped hot, it presents a uniform yellow color. If in dyeing a royal blue the oxide of iron deposited upon the fiber is transformed into prussian blue, the action is the more complete as it is aided by heat, and the blue ring, which is but slender, even after a long steeping in the cold, becomes broader in two hours in heat than in twenty-five hours in cold, and in the course of five hours it is dyed uniformly. Silk mordanted with iron and dyed to saturation with astringents takes uniformly with galls a dark bluish-gray, a lighter and bluer shade with chestnut, a reddish maroon with catechu, and a grayish-blue with logwood. A silk ironed and blued imperfectly and then dyed to saturation with galls, hot, shows an outer black-blue ring, and the center keeps the shade produced by galls upon silks mordanted with iron. Lastly, in dyeing blacks in such as have a ground of prussian blue, the blue being always imperfect, such silks present a blue-black ring, and the center, though strongly dyed, is never black.—*Marius Moyret, in Chem. Review.*

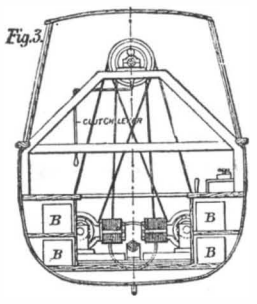
NEW BOAT PROPELLED BY ELECTRICITY.

Our engraving shows the small boat propelled by electricity lately tried on the Thames River. The hull is of iron,



NEW ELECTRIC BOAT.

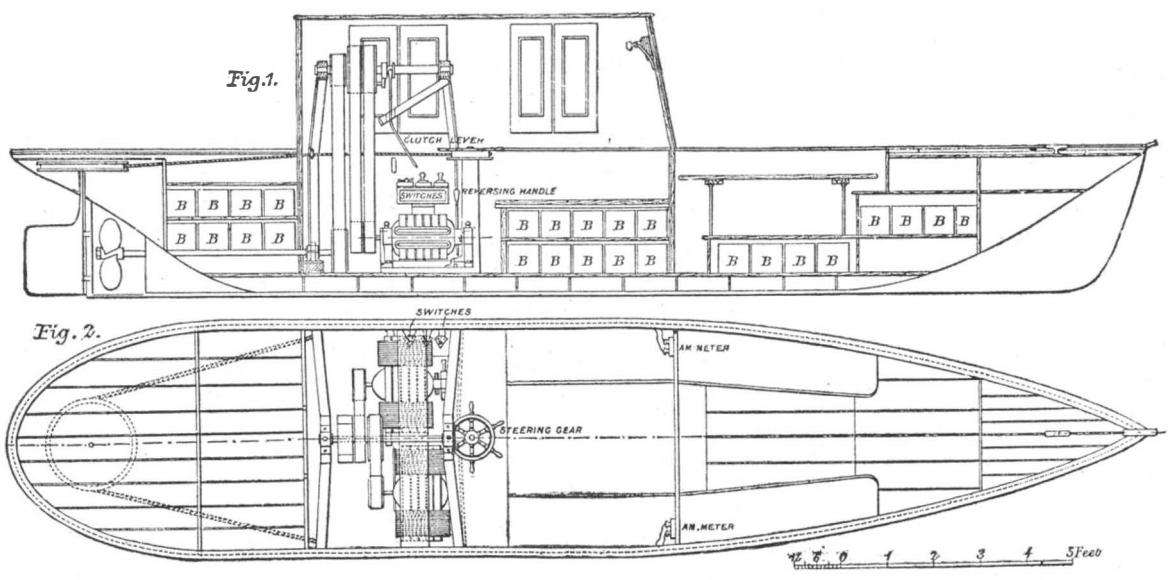
25 feet long, 5 feet beam, drawing 21 inches of water forward and 30 inches aft. She is a screw boat, the propeller being of the Collis-Browne type, 20 inches in diameter, and with a 3 foot pitch. The screw is calculated to make 350 revolutions per minute. Twelve persons can be accommodated on board, though only four were actually carried on the trial trip. The electric engines are nothing else than a pair of Siemens' dynamos, of the size known as D^3, and their motive power is furnished by Sellon-Volckmar accumulators. We



TRANSVERSE SECTION OF ELECTRIC BOAT.

may briefly remark that these accumulators are a modification of those of Plante and of Faure, but are made of specially compact design for the purpose of electric navigation. The cells each contain forty prepared plates, and weigh about forty pounds. They are about 10 inches square and 8 inches high, and are charged while the boat is lying at anchor by wires which come across the wharf from the factory, bringing currents generated by dynamos fixed in the works. There is room for a battery of fifty-four such cells to be stowed away, as will be seen upon the drawings, where the battery cells are marked B B. Only forty-five cells were used at the trial trip. They had a total electromotive force of ninety-six volts, and were capable of furnishing continuously for nine hours a current exceeding thirty amperes.

When in action the counter-electromotive force of the motors reduces the apparent strength of the current according to Jacobi's well-known theory of electro magnetic engines. The accumulators have a total weight of somewhat less than a ton. The motors of electric engines are arranged so that either or both of them may be furnished with the current, there being a switch to each lead. There is also a commutator to switch into circuit any number of cells from forty upward. One of the motors can be thrown in or out of gear by means of an Addyman's friction clutch, which permits the pulley to be started and stopped with great facility without shocks. A reversing gear for the two motors is contrived by the very simple device of arranging two pairs of brushes for each collector or commutator, one pair having an angular lead forward, the other a lead backward. By a simple lever arrangement either pair of brushes can be pressed at will against the segments of the commutator. In practice this arrangement works well, the boat being very readily stopped by reversing the engines in this fashion. As will be seen from the drawings, the motors are connected by belts to pulleys on a countershaft, from which a belt passes down to a pulley on the propeller axis, whose speed is thus reduced in the proportion of 950 to 350 revolutions per minute. The steering is managed by the same person who operates the switches, seated in the central cabin. A whistle being impossible in the absence of steam, this necessary feature is replaced by a large electric bell, also worked by the accumulators. The calculated average speed is nine miles per hour. This speed, says *Engineering*, was actually attained on the trial trip from Millwall to London Bridge and back.



NEW BOAT PROPELLED BY ELECTRICITY.

The Coercitive Force of Steel Rendered Permanent by Compression.

This is the title of a very interesting paper, presented by Mons. L. Clémandot to the Académie des Sciences on the 2d of October. The result obtained by M. Clémandot is as follows: When steel is tempered by compression, that is to say, when it is cooled under pressure after a quick cooling, obtained partly by compression, the coercitive property of steel is maintained, notwithstanding the reheating and even forging; it is permanent and indelible whatever be the subsequent operations to which it is submitted. While steel tempered in a bath is hard, unworkable, and often distorted, compressed steel can be worked up again as if it were soft; it can be filed, drilled, etc., which is an inestimable advantage for manufacturers of magnetic apparatus, magneto-electric machines, telephones, etc., who often lose valuable time by working upon magnets which break at the last moment. M. Clémandot's paper seems to us, says the *Electrical Review*, to have a special bearing, and it would be very important to know if steel prepared by his method really possesses the permanence which the author attributes to it; we could, if it is so, construct amperemeters and voltmeters with permanent magnets, whose constancy and exactness would leave nothing to be desired. We hope that the commission charged with the examination of the researches of M. Clémandot, and composed of MM. Dumas, Boussingault, Fremy, Debray, and Breguet, will not delay its opinion upon this important question.

Engineering says: In a recent note we announced that M. Clémandot had discovered a process of tempering steel by compression, and that steel thus tempered acquired the coercitive force or power of becoming magnetic which characterizes ordinary steel. Later experiments have shown him that this force is permanent and does not disappear even after reheating or forging of the steel. It is well known that ordinary steel tempered by sudden cooling in a bath of water or oil from a cherry red heat loses its temper and coercitive force if it is reheated and softened. Not so the compressed steel; according to M. Clémandot its magnetic power is indelible whatever its subsequent manipulation. He took several plates of the core of a magneto-electric machine, broke and forged them into a bar which he has compressed and cut into plates, then magnetized them, and thus restored the magnetic power which they had at the beginning. This power remained constant, although the plates were afterward heated and reforged. This is a valuable property of the new steel for electromagnetic appliances, such as telephones and magneto-electric machines which are apt to lose their magnetic properties. The compressed steel, after being worked over again, is also soft and homogeneous, whereas tempered steel is hard and often deformed.

ACCORDING to Ad. Carnot, a non-poisonous and permanent new green color may be prepared as follows: A solution of bichromate of potash is mixed with a sufficient amount of phosphate of soda; sodium acetate and sodium thiosulphate are added, and the slightly acidified mixture is boiled for an hour. A fine green precipitate is thrown down, which is not volatile, and is perfectly fast against air, light, dilute acids, soap, etc. It may be used for painting, calico printing, etc For dyeing the material to be dyed is treated with a mixture of bichromate, phosphate, and acetate of soda, and is then boiled in a slightly acidulated bath of thiosulphate of soda.

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THE PERIPATUS AND ITS REMARKABLE METHOD OF CAPTURING PREY.

BY C. F. HOLDER.

Among the many interesting creatures that have been unearthed by scientific investigation during the past few years, the peripatus deservedly stands foremost in the rank, not alone for its peculiar individuality, but for certain habits shown when obtaining food and defending itself from attack. According to late classification, it forms the single insect of the sub-class Malacopoda, and is only represented by a single genus—Peripatus. It is considered an extremely ancient form, from its wide and peculiar distribution, being found at Cape of Good Hope, St. Thomas, Australia, New Zealand, Chili, and Isthmus of Panama, and thought the nearest extant representative of the ancestors of our air-breathing anthropoda, spiders, etc.

In appearance the *Peripatus capensis* is exceedingly disagreeable, resembling a large black caterpillar, three inches or more in length. From the head protrude a pair of curious jointed horns like antennæ that incline forward, seemingly used as feelers, though the head bears a small pair of simple eyes. Beneath is the mouth, with its singular turned lips and double pair of horny jaws, well adapted for crunching the larger game it affects. The seventeen pairs of feet are short, fleshy, and provided with two short claws adapted for clinging upon rocks or trees. The body is cylindrical and soft, the integument not chitinized, and head not separate from the body, its great difference from other anthropods being in its "two widely separated minutely ganglionated nervous cords sent backward from the brain; also in the minute numerous tracheal twigs arising from the many minute oval openings situated irregularly along the median line of the ventral surface of the body." It calls to mind features of Lingualulina and Tardigrada by its curious soft clawed feet, and, according to Packard, is not a worm, but an intermediate between them and the sucking myriopods. Its method of breathing is peculiar in the extreme. Instead of the tracheal tubes opening to the exterior by small stigmata arranged along the body in regular order, as in other animals that have tracheæ, their tracheæ are scattered here and there over the entire body. It appears, says Moseley, that we have existing in *Peripatus* almost the earliest stage in the evolution of tracheæ, and that these air tubes were developed in the first tracheate animal out of skin glands scattered all over the body. In higher tracheate animals the tracheal openings have become restricted to certain definite positions by the action of natural selection.

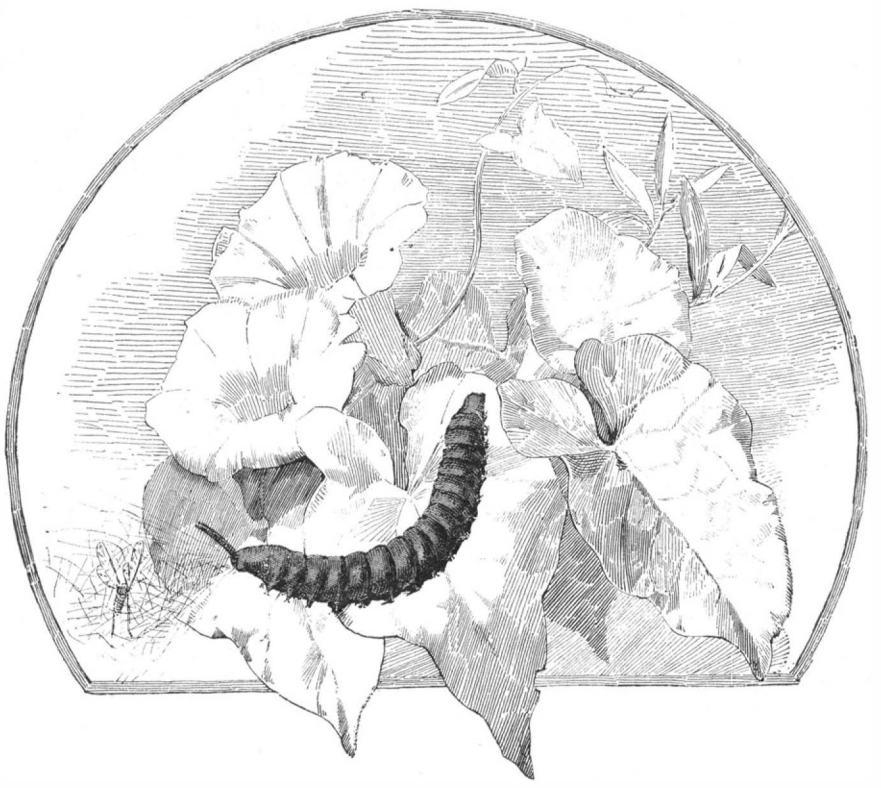
The sexes are distinct, and the males much smaller and rarer than the females. Out of fifty specimens found only two were males. The females are viviparous, and, according to the above mentioned distinguished author, a standard-bearer of the lamented Darwin, the process of development of the young shows that the horny jaws of the animal are the slightly modified claws of a pair of limbs turned inward over the mouth as development proceeds; in fact, "foot jaws," as in other anthropods.

To Moseley is due all the present knowledge concerning this curious insect, and previous to his elaborate examinations at the Cape of Good Hope nothing was known as to its method of breathing air by means of tracheæ, scientists believing it to be an annelid.

In the accompanying cut the great peculiarity of the animal is shown. Being slow, cumbersome, and utterly unable to pursue game, it seems to have been provided by nature with ample compensation. We see it lying upon the ground almost invisible, so similar is it in color to its surroundings; a fly or some larger insect approaches; the two horns dilate, move to and fro, as if in excitement, and the approaching fly, when within several inches, suddenly stops, as if paralyzed and unable to move, but remains suspended in the air. We draw nearer and see the cause of this phenomenon. At the approach of the victim the *Peripatus* has ejected from its mouth curious thread-like jets of some glutinous irritating fluid that forms instantaneously, as if by magic, a complete network of gleaming, glistening web, that resembles the maze of the spider with its quivering drops of dew. Myriads of these glistening darts or threads encompass the victim, holding it in a close embrace until the unwieldy *Peripatus* approaches, breaking through the sheeny prison and releasing the victim to a worse fate.

This remarkable web is found to proceed from large glands that secrete a clear viscid fluid that seems to crystallize when ejected from the papilla, one of which is found at each side of the mouth. If the *Peripatus* is attacked suddenly the web appears in front of it instantly, the jets forming a perfect protection from many enemies, as it is almost as tenacious as birdlime. It is not an irritant when tasted, but when taken from the glands and placed upon a glass slide, forms a trap for the largest insects, holding them securely.

The food of the *Peripatus* is, however, to a great extent, vegetable, and in the stomachs of nearly all the specimens examined by Professor Moseley at Good Hope, vegetable matter was found. In their habits they are similar to the common centipedes, living under logs, stones, and dead wood. They are nocturnal insects, moving about in a slow, hesitating manner in the day-time. When at rest the body is perhaps two inches long, but in motion they stretch out in a surprising manner to nearly twice that length. Most of the specimens found by Professor Moseley were in old willows that were highly luminous, and in the weird light the insects were seen coiled up ready for transportation to



THE PERIPATUS.

the collecting case. Professor Moseley thus describes the search for this *rara insecta:*

"My colleague, the late Von Willemoes Suhm, and I both searched hard for *Peripatus.* He was unsuccessful, but I was lucky enough to find a fine specimen first under an old cart wheel at Wynberg. Immediately that I opened this one I saw its tracheæ and the fully-formed young within it. Had my colleague lighted on the specimen he would no doubt have made the discovery instead."

In New Zealand, the species known as *P. Novæ Zealandæ,*

THE DOVE FLOWER.

is found among the dead wood near Wellington. Here also the females predominate. It much resembles the *Capensis,* having, however, thirty feet instead of thirty-four.

Equally remarkable as a web constructer are the larvæ of a lepidopterous insect, the *Hyphantidium sericarium,* found in Australia. Myriads of the creatures join forces and produce a silken web, in some cases measuring nearly three hundred square feet. Mrs. Thos. Wiseman, of Australia, has successfully raised numbers of them and sent specimens to Europe. Mr. Helenus Scott, of the Wollombi, thus refers to her work in a communication sent to an English naturalist with some specimens:

"Mrs. Wiseman had placed a quantity of shelled maize in a veranda room, 8 feet 6 inches long, 6 feet wide, and 9 feet 3 inches high, the stone walls being plastered. At a subsequent period, this room being required for a bedroom, the walls were found to be entirely and uniformly covered by a beautiful white-colored web, fastened at the ceiling, floor, and corners by a stouter and coarser fabric, and occasionally to portions of the wall itself; so that in this instance an unbroken sheet of cloth, containing some 72 square feet, might with care have been obtained; while the web measured at least some 252 square feet. The specimens of this cloth sent to me, rudely torn from the walls, were of the size of a large handkerchief. The remaining portions of the original construction had been ruthlessly destroyed by the servants. The larva, when full-grown, is about five-twelfths of an inch in length, with the head and first annulation depressed, somewhat horny, and of a blackish-brown. It possesses sixteen feet.

"It is of a pale yellowish-white color, with whorls of six small black spots on each annulation, each emitting a tiny hair. The caudal segment is spotted with brown.

"In confinement these caterpillars were found to be active, with a dislike to the light; so that, when exposed, they immediately commenced spinning their web, connecting together several grains of the maize, upon which they subsisted. They likewise lined the top and sides of the box with their silken tissue.

"At the latter end of August they assumed the pupa state, each larva forming a separate cocoon for itself among the maize, consisting of a flimsy web somewhat tightly enveloping the chrysalis, which was of a light yellowish-brown, with the wing cases largely developed and one-third of an inch in length.

"The perfect insect took wing in October, and is three-fourths of an inch in expanse, and active in its movements. The superior wings were elongated, the costal margin arched, and apices rounded. General color grayish-brown, of a silvery hue, with stigmata and strigæ of a darker color. Inferior wings of a light semi-transparent silvery hue, with a deep marginal fringe. Thorax similar in color to the anterior wings, and not crested. Abdomen yellowish; the whole of the under side light silvery-gray. The wings are slightly convoluted in repose."

THE DOVE FLOWER.

The dove flower, or *Peristeria alata,* is very rare with us, as its home is Central America. The leaves of the flower are white and spotted, and give the flower the appearance of a white bird with extended wings. The inhabitants of Central America adore this flower, believing that it represents the Holy Ghost on account of the resemblance to a white dove, the symbol of the Holy Ghost. For that reason the flower is also known in that country as "Flora el Spirito Santo." The flower represented in our cut was in bloom in the garden of Mr. L. M. Stone, 482 Franklin avenue, Brooklyn, a short time ago.

Zinc in Boilers.

The author finds that a battery is formed by the iron and the zinc, which occasions a continuous decomposition of water. The oxygen combines with the zinc, and the zinc oxide combines with the fatty acids present in the feed water, forming a zinc soap, which prevents the adhesion of saline matter to the sides and plates of the boiler. The hydrogen prevents the danger of explosion from the absence of gaseous matter, and consequent superheating. When a boiler has been kept for a considerable time with its fire banked up, the hot water is totally deprived of air, and on then raising the heat an explosion is possible. In such cases he recommends that a part of the water should be run off and fresh water containing air introduced in its stead.—*M. Trève.*

A Hint for the Treatment of Phthisis.

Mr. H. Osborn Bayfield suggests (*British Medical Journal*) that the use of inhalations of volatilized palm oil may be useful in the treatment of phthisis. He bases his opinion upon the fact that workmen engaged in tinning where palm oil is used as a flux inhale the volatilized oil and get fat. Those previously emaciated or weak rapidly improve. The idea is worth a trial.—*Medical Record.*

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RECENT INVENTIONS.

Electric Coupling for Train Telegraphs.

Mr. Edward D. Parker, of Salina, Kan., has lately received a patent for a new electric coupling for train telegraphs, for signaling from the cars to the engineer.

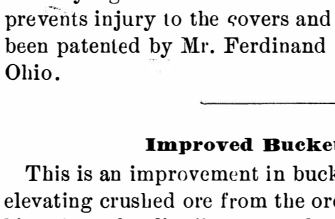
Beneath the locomotive cab is placed a galvanic battery. The cab contains an electric bell, which is connected with the battery wires, the electric circuit extending beneath the tender and cars to the rear car where the ends are connected. The wires, A, are incased in a covering of wood by which they are insulated and protected from injury. In the cab of the locomotive is a switch for breaking the circuit when the locomotive is not in use. In each car of the train there are press buttons placed at convenient places. The coupling devices between the cars by which the wires are coupled,

are applied in connection with the wooden covering of the wire, as is clearly shown in the engraving. The tongues, G, and springs are so placed that when the ends of the sections are brought together, the tongues of one section pass between the springs of the other section, thus separating them, and at the same time establishing a metallic connection of the wires, A A. With this arrangement the bell in the engine cab may be operated from either car by movement of the press buttons.

In case the train is separated by the breaking of the car couplings, the couplings of the electric cord will draw apart, and the springs, coming together, will close the circuit and the bell will be operated.

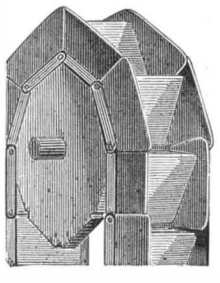
Book Support.

The annexed engraving represents an improved device for supporting a book in such a manner that both surfaces of the opened book will be about level. The invention consists of an angular rod or bar pivoted on a base at its angle, the arms of the bar or rod resting on springs fastened on the base below the arms. The arms have anti-friction wheels or pulleys pivoted in the ends. One end of the book is placed on the support in such a manner that the back of the book is on the angle of the rod or bar and the covers rest on the ends of the rod or bar. By this means the leaves of the opened book will be held level. This useful device can be used under either end of a book, or if desirable under both ends. It is not only a great convenience to the user of the book, but prevents injury to the covers and back. The invention has been patented by Mr. Ferdinand Schubert, of Higginsport, Ohio.



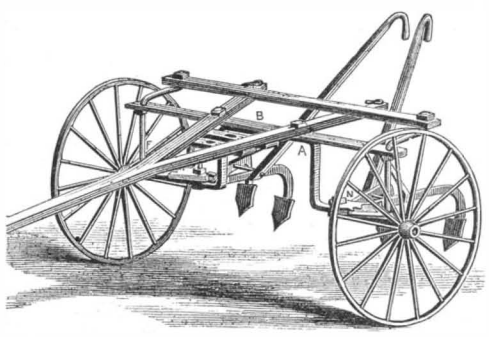
Improved Bucket Elevator.

This is an improvement in bucket elevators, or carriers for elevating crushed ore from the ore breaker or crusher to the bins above for distribution to the stamps, and for carrying grain and for other like purposes. Its construction is such as to prevent fine sand and other hard substances from getting in the joints. The carrier consists of plates having flanges turned over at the edges and connected in an endless chain by pivot rods. The plates are curved at the end, overlapped by the end of the next plate, so that with the lapping of the flanges of the sides of the plates the joints are made sufficiently close to exclude fine gravel or sand getting inside to wear the joints and clog the drums and the carrier thereon. The buckets are attached to the carrier plates, the latter forming the back to the buckets. The carrier is mounted on drums having faces corresponding in length with the length of the plates. For carrying grain the machine may be arranged in horizontal position, or nearly so, and in that case supporting rollers may be arranged at suitable intervals along the carrier to hold it up in line; but the carrier is more especially intended for use in ore crushing mills, for which it is intended to provide a practicable means of elevating ore from the ore breakers to the bins in order that the breakers may be located low down on a solid foundation. This improvement has been patented by Mr. James Boardman, of Hayward, Dakota Ter.



Cultivator.

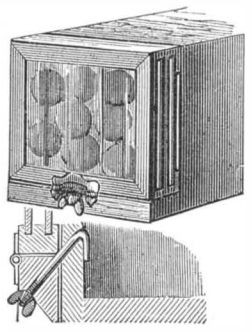
The engraving shows an improved cultivator, which is easily controlled and guided. It is the invention of Mr. Thomas A. Burkett, of Charleston, Kan. The frame of the cultivator is formed of an arched bar, A, and a crossbar, B, attached to the upper horizontal part of the bar, A, and is of such length that its ends will be directly over the ends of the arched bar. The tongue of the cultivator is forked and its branches are bolted to the frame, the branches projecting in the rear and having hooks attached to the ends to receive and support the plow beams away from the ground when turning around or moving from place to place. The wheels revolve upon the lower crank arms of the axle, F, the upright arms of which work in bearings in the frame. Upon



the upper ends of the upright arms are crank arms that project rearward at right angles to the lower cranks of the axle, and work in bearings in the ends of a crossbar placed on the top of the forks of the tongue. A pair of plow beams, provided with plows and handles in the usual manner, are hinged to a coupling rigidly connected with a bolt, N, that passes through and works in a bearing in the lower horizontal part of the arched bar, A. To the upper ends of the bolts, N, are rigidly attached segmental gear wheels, the teeth of which mesh into corresponding gears attached to the upright part of the double crank axle, F. With this construction, when the team turns in following a crooked row, the resistance of the plows, communicated through the gear segments, turn the crank axles and cause the wheels to follow the turn of draught, so that the plows will also follow the same line and be easily guided.

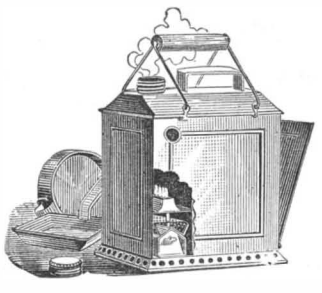
Sample Displaying Lid.

The engraving represents a new sample displaying lid, having a front glass and a wooden sliding back, between which and the glass the samples to be displayed are placed. This device has been patented by William H. and Thomas F. Wheeler, of Cape Girardeau, and John B. Wheeler, and Charles M. Slack, of Jackson, Missouri. When any of the contents of the packing case are to be removed, the display frame is raised and the lid of the box is opened. As soon as the frame is released it will be closed automatically by the spring of the hinge. When the packing case is empty the frame is removed and placed on another case, and the samples in the lid are changed accordingly. The samples are placed in the lid between the slides, and are visible through the glass slide.



Novel Dinner Pail.

The annexed engraving represents a very compact and convenient dinner pail, provided with apparatus for heating or cooking food of all sorts. It will boil, fry, or toast, and has a frying pan with folding handle, a water heater with a screw top, and other conveniences to adapt it to use. The fuel burnt is kerosene, and the lamp is constructed so that it yields a clear, strong, and smokeless flame. The compartment for food and dishes is entirely separate from that containing the lamp, and the inner surfaces of the pail which are subjected to heat are lined with asbestos, which prevents the heat from radiating, and also prevents the tin of which the device is made from being discolored by heat. The water heater is of convenient form for applying heat to the body, and may be used in case of necessity for that purpose, the water contained by the heater being capable of retaining its heat for a long time. The device will be found very useful for heating food for infants and for other similar uses.

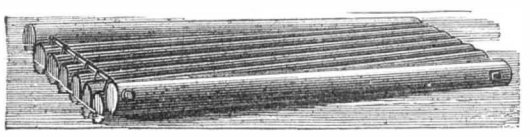


Large sizes are made for camping and excursion purposes.

This device is the invention of Mr. Frederick Reichmeire, of 106 West Eighteenth St , New York City.

Novel Timber Raft.

An improved method and apparatus for coupling gangs of logs for timber rafts, so that they may be easily and effectively bound together in a raft, has been patented by Mr. Robert E. Terry, of Bay Minette, Ala. The accompanying engraving shows a raft in which one end of each log is bored through near its end for the passage of an iron rod, that may be of any desired length. It is provided at its ends with nuts for holding the side logs upon the rod. The opposite ends of the outside logs are then bored (as shown in the engraving) for the passage of a similar rod. This rod when it is placed passes through the ends of the outside logs



and over the ends of the inner logs, and when in this position one end of a small rod or wire is secured to the rod and then wrapped around each log and over the rod, and finally secured to the rod. A raft of logs formed in this manner binds all the logs firmly together, obviating all danger of the loss of logs, and is not expensive, as the rods and wire are not subject to wear, and may be used over and over.

An Army Surgeon on Shoes.

At a recent meeting of the Hygienic Congress at Geneva, Colonel Ziegler, who is chief surgeon of the Federal army, read a paper on the evil effects of badly made shoes, with special reference to hygiene and the marching power of soldiers. Colonel Ziegler mentioned that the Swiss examining surgeons are compelled to reject every year 800 recruits—the strength of a battalion—for malformation of the feet, resulting from badly fitting shoes. The foot is in reality a bow, so elastic that, at every step, it contracts and expands, lengthens and shortens, and a line drawn through the center of the great toe intersects the heel. But shoemakers, who are generally utterly ignorant of the anatomy of the foot, do not give room enough for the lateral extension of the great toe. They crib, cabin, and confine it until it is forced against the other toes. Hence arise frequent inflammations of the great toe, corns, ulcerations, and sometimes veritable articular inflammation. Another evil, which Colonel Ziegler ascribes in great measure to bad shoeing, is flat-footedness, whereby the arch is converted into a straight line, and prolonged walking and marching rendered impossible. Another cause of this defect is the habit of carrying heavy weights at an early age; but in most instances, Colonel Ziegler contends, perfect shoes would restore the foot to its normal condition. The first obstacle to a reform in the shape of shoes lies in the fact that it would involve a great expense in the shape of new lasts, an expense that shoemakers are naturally loth to incur. Fashion has also its lasts, and shoemakers consider themselves bound to conform to the prevailing mode. A test of a perfect pair of shoes is that, when placed together, they should touch only at the toes and heels; the soles should follow the sinuosities of the feet, and, to give room for their expansion, should exceed them in length by fifteen to twenty millimeters.

Fatal Explosion of Fireworks.

A short time since mention was made of the experiments of Professor Jackson, pyrotechnist, of Philadelphia, demonstrating the highly explosive character of colored fires under favorable conditions.

The warning given seems not to have been heeded; at any rate a frightful accident with colored fires sadly marred the festivities in Fairmount Park, Philadelphia, on the evening of October 24, during a pyrotechnic display forming part of the celebration of the Penn Bicentenary.

From some unexplained cause a large iron mortar, which was used for projecting the bombs filled with colored stars, exploded with terrific force, scattering fragments of iron among the bystanders, killing several persons and wounding others. The mortar was of three-eighths inch iron, and evidently not intended to withstand more than a light charge of powder. The untimely bursting of a bomb in it was followed by much more violent effects than would seem to have been possible with the amount of explosives involved, unless the latter were of more than ordinary explosive force. It is probable that the colored stars were important factors in producing the disaster.

Aerial Photography and Telephony.

The Municipal Council of Paris having voted a grant of 1,000 francs to the Academy of Meteorological Ascension for the purpose of making experiments in aerial photography, an ascent was lately made by members of the Academy from the Carrefour de l'Observatoire. They carried with them an apparatus for taking instantaneous photographs. This had six lenses pointing to different directions, so as to embrace the whole of the horizon and to produce a panoramic photograph. The balloon rose 200 meters. A telephone was afterward fitted up in the car to enable the occupants to communicate with their friends below.

THE dimensions of the Union arch of the Washington aqueduct, it would appear, exceed those of any of the celebrated engineering structures which are most commonly pointed to as wonderful achievements in masonry. The entire span is 220 feet, or twenty in excess of the span of the famous Chester arch across the Dee in England; 68 feet longer than the central arch of London Bridge; 92 feet longer than the noted bridge over the Seine at Neuilly, and 100 feet longer than the arches of the Waterloo Bridge over the Thames. The height of the Washington arch is 101 feet.

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ENGINEERING INVENTIONS.

An improved hand car has been patented by Mr. Allen M. Stoner, of New Albuquerque, New Mexico. This invention relates to that class of railroad hand cars which have only three wheels; and it consists principally in the employment of a double-acting lever having pawls, in combination with a large wheel for driving the car.

Mr. Theodore M. Sharpe, of Salisbury, Mo., has patented an improvement in car couplings. The coupling has a hook pivoted in a drawhead and pressed downwardly by a spring to cause it to engage with a link secured in an opposite drawhead after the link has raised the hook by its impact with it, thereby automatically coupling the cars.

An improved governor for steam engines has been patented by Mr. Joshua P. McCook, of Richmond, Va. This invention is an improvement in the class of valve gear governors having weighted arms or levers that operate by centrifugal force to regulate the cut-off according to the speed of the engine, thus in turn increasing or diminishing the speed correspondingly. This governor has a compound or variable eccentric in connection with the weighted levers, a spring applied to the latter, which supplements the effect of gravity in resisting centrifugal action, and thereby serves as a means for regulating the action of the governor upon the eccentric that reciprocates the valve or cut-off.

Messrs. John Wilson Brown and John Wilson Brown, Jr., of Baltimore, Md., have secured patents for apparatus for loading and unloading vessels. The apparatus consists in a removable frame work, which is to be located above the hatchway of the vessel, provided with independently-moving and downwardly extensible sections of frame work, which may be extended a greater or less depth into the hold of the vessel. These sliding sections of the frame work are provided with guides for and are combined with an endless carrier, to which the packages are slung, and by which they are raised or lowered and transported across the deck to or from the wharf. This apparatus is calculated to greatly facilitate the work of loading and unloading vessels.

MECHANICAL INVENTIONS.

Mr. William A. Mahaffy, of Rushford, Minn., has patented certain improvements in that class of flouring mills in which rolls revolving in close proximity to each other are employed for reducing the grain. The improvement consists in the peculiar construction and arrangement of the adjusting devices for the laterally-movable roll, and in the means for locking the movable roll in working position.

Mr. John C. Wilson, of Washington, Pa., has patented an improvement in that class of washing machines in which the box or tub oscillates and the rubber is stationary within the box. The machine washes by squeezing the clothes introduced into the box at each end between the slats at the ends of the box and the stationary rubber, the box being suspended and oscillated and the clothes turned with each swing of the box.

An improved circular sawing machine has been patented by Messrs. Florian Reinhart and Theodore R. McDonald, of Toledo, O. This invention consists of rotary feeders and saws for cutting off both ends of felly and shaft sticks for wagon stock, also any other sticks to be equalized in length, the rotary feeders being provided with means for taking the sticks up one by one on the faces of the feeders from a table whereon they are placed for the purpose, carrying the sticks past the saws, by which the sticks are cut to the lengths required.

An improved wagon spring, patented by Mr. Albert H. Cadugan, of Wales Center, N. Y., consists in coiled springs arranged between the bolsters of a farm wagon, and riders for the wagon box bed to rest on, the riders being located over the bolsters, and secured and guided by the bolster stakes in their play upon the springs, the springs being so contrived that as they are compressed by the load, their power is proportionately increased by the shortening of the distance between the bearing points of the supporting arms and the coils of the springs for uniformity of elasticity with light and heavy loads.

A machine for forming and sharpening horseshoe calks has been patented by Mr. James Elliott, of Jefferson, Wis. This machine has two upright plates, between which slides a plate carrying a knife and operated by a cam-lever, to which power is applied by means of a hand lever and connecting bars. The front plate of the machine is provided with a sliding plate for clamping a shoe against a die secured in a slot in the front plate, the clamping-plate being operated by a cam-lever and held in place by a lever-pawl engaging with ratchet teeth upon the upper edge of the front plate.

Mr. Alexander Melzer, of New York city, has patented an improved loom which can be adjusted to be adapted for weaving netted fabrics of any desired pattern. The loom is provided with a loosely mounted twister for each pair of warp threads, the warp threads passing longitudinally through the twister and through opposite eyes at edges of one end of the twister, whereby the warp threads will be twisted when the spool is rotated. Around each twister a cord is coiled having a weight attached to its lower end and having its upper end attached to a pivoted lever connected with a treadle, whereby all the twisters connected with this treadle will be revolved when the treadle is depressed, and all the corresponding warp threads will be twisted, the combination of the twisters and treadles being varied as the design may require.

AGRICULTURAL INVENTIONS.

An improved sulky plow has been patented by Mr. Eugene Powell, of Delaware O. This is an improvement in the class of plows managed by the driver, who rides and operates the various levers while sitting. It is readily controlled and renders the work of plowing easy.

An adjustable straw stacker, patented by Mr. William R. Maloy, of Wayland, Mo., facilitates the stacking of straw as it comes from a thrasher and separator. This is a carrier of novel construction mounted on a pivot and capable of swinging laterally to deliver the straw to any portion of the stack.

Mr. John M. Walden, of Fort Valley, Ga., has patented an improved cotton chopper, consisting of a frame of beams and cross bars with runners and chopping hoes, the beams being adjustable toward and from each other to vary the distances of the hoes apart, and according to the distance required between the chops in the rows of plants. The hoes are adjustable in height and in their pitch to regulate the depth of the chops.

Mr. George L. Gifford, of San Antonio, Texas, has patented a combined seed planter and cultivator. The cultivator is constructed in such a manner that the plows may be adjusted up and down for depth of cut, and also for width. Detachable seed dropping and planting devices are adapted to be attached to the cultivator, and are operated from the wheel that supports its forward end. In planting the plows of the cultivator are removed and furrow-opening and covering plows are substituted.

Messrs. Thomas J. Lindsay and William J. Miner, of Windfall, Ind., have patented improvements in corn planters. The bottom of the seed hopper is slotted for the passage of an endless chain, that carries blocks, in each of which is formed a cavity of such a size as to receive enough seed for a hill. The chain revolves around a hexagonal pulley in the bottom of the hopper and a pulley in the upper end of the spout that conducts the seed to the hill. The seed is kept in the blocks by an angle plate until the pulley is turned far enough for the seeds to drop together from the block.

ELECTRICAL INVENTION.

Improvements in secondary batteries have been patented by Mr. Nicholas De Kabath, of Paris, France. The electrodes for the battery are formed of very thin sheets of lead coated with weak sulphuric acid to form a thin coating of sulphate of lead. Thicker sheets of lead are treated by the same process, and bent over the thin sheets, and the whole are wrapped and packed in artificial parchment, one or more layers being used according to the internal resistance to be obtained. The battery thus formed is placed in a lead box lined with thin sheets of lead.

MISCELLANEOUS INVENTIONS.

An oil conductor for car axle boxes, patented by Mr. Julius De Long, of Allegheny, Pa., consists in animal hair, washed, picked, carded, and oiled, to adapt it for use as an oil conductor for car axle boxes.

Mr. Robert D. Green, of Columbus, Miss., has patented an improved permutation padlock. The object of this invention is to increase security in this class of locks. The lock is an ingenious combination of ratchet wheels, tappets, and tappet wheels.

Mr. Charles T. Hayden, of Whitesborough, Tex., has patented an improved tanning compound, composed of soft water, sulphuric acid, terra japonica, leachings from horse manure, starch, dog fennel, cured leaf tobacco, bromweed, and common salt. This preparation is said to tan skins very quickly, and to produce leather that is tough and durable.

An invention to prevent the noise caused by the running of trains on elevated roads has been patented by Mr. Thomas Coates, of Waterville, N. Y. The invention consists in the combination with the stringers, girders, and columns of iron bars extending into the ground. The bars are connected to these parts by eye screws, clamps, or any other suitable means.

A new design for watch chains and attachment has been patented by Mr. Calvin W. Little, of Denver, Col. The strips of metal of which the links of the chain are formed are of equal width through their length, and the link is doubled upon itself twice, in such a manner that it has two loops opening at right angles to each other. The attachment is made to resemble a mail bag having loops at the top and bottom.

A handsaw and spirit level, combined in one instrument, has been patented by Mr. John E. Tyler, of Roxobel, N. C. A hole is bored in the saw handle, from the end to which the blade is attached that is parallel to the back of the saw, and in such a relation to the handle that the level inserted in the hole will be seen from within the hand hole when the saw lies on its back edge. Suitable devices are provided for adjusting the level.

Mr. Thomas H. Chubb, of Post Mills, Vt., has patented a novel tie-guide for fishing rods, made of a piece of metal having pointed ends, inclined side edges leading inward from the bases of the points, and curved recesses between the inner ends of the inclined side edges and the bases of the points. This piece of metal when bent into its final shape forms a short thimble with projecting arms, which are to be tied to the fishing rod.

Mr. John W. Hazelrigg, of El Dara, Ill., has patented an improvement in grain-separators, in which the blast through the flue is varied at will by varying the speed of the hand crank to be suited to the weight of the grain and the matters to be separated from it; the chaff and other light matters are separated from the grain by a current of air passing upwardly through a flue down which the grain falls, the lighter particles passing through the fan producing the upward current.

A device for holding coupling links in a drawhead at the proper inclination for coupling has been patented by Mr. Francis M. Wilson, of Tekamah, Neb. A double U-shaped spring frame is passed through the link and back into the drawhead, in which it is held by the pressure of the separated ends of the two shanks of the spring against the sides of the drawhead, the opposite ends of the shanks being connected.

Mr. James O. Neill, Lolland, Minn., has patented improvements in devices for holding bags. In the bottom of a tubular standard is a coiled spring, on which the stem of the hopper of the device rests. The hopper is funnel shape, and flanged or flared at its lower end. The bag is held to it by any suitable tie. The spring in the standard holds the bag from the floor until the bottom is filled out, after which the contents of the bag are allowed to carry it down until its bottom rests on the floor.

A simple and inexpensive support for wagon tongues has been patented by Mr. Ela Moore, of Walla Walla, W. T. To the center of an ordinary half-elliptic spring is secured a bar that extends forward under the tongue of the wagon. The ends of the spring are secured under plates attached to the axle. The bar secured to the spring is formed with a series of holes, and is held in place on the tongue by a bolt, the position of the bolt in the bar regulating the tension of the spring.

Mr. Wesley F. Collie, of Barren Fork, Ark., has patented a device for drawing water from a well or cistern at some distance from the house. A cable extends from the house to the well on which a carrier is mounted. A rope attached to a windlass at the house passes through the carrier and has a hook at its end from which a bucket is suspended. The bucket is run from the house to the well on the cable and lowered to fill with water, and drawn up and back by the windlass.

Mr. Arthur O. Barnes, of Moore Park, Mich., has patented improvements in the journal bearings of axles that lessen the friction and insure continuous oiling of the journals. The journal box has heads fitted into it that have openings to receive the journal, and a set of friction rollers, and a shell attached to the heads incloses the rollers and forms an oil chamber. The journal box is kept in its place by collars screwed into the countersunk sides of the head, and a nut screwed on the end of the axle.

Mr. George Ellsworth, of Bowling Green, O., has patented a bee hive which may be opened at any time by taking off the top, sides, and ends, without disturbing the frames nor materially disturbing the bees within the spaces between the frames, thus exposing the frames to the view of the keeper to see the condition of the bees at any time, enabling him to handle the bees and frames without crushing the bees or breaking combs or frames.

A showcase that is especially adapted for grocers' use for showing tea, coffee, etc., has been patented by Mr. Robert S. Williams, of New York city. The case consists of a frame formed with inclined shelves for supporting in an inclined position the boxes on which the goods are, glass covers being provided for closing over the boxes. The edges of the covers are hinged to the bottoms of the inclined shelves, and are held open by means of jointed braces attached to the ends of the covers and to the sides of the case.

Improvements in stereoscopes have been patented by Mr. W. Le Conte Stevens, of New York city. The stereoscope is so constructed that the lenses may be adjusted independently of each other, to be adapted to any pair of eyes, and for any stereograph, and is also provided with movable screens, by which either eye may be permitted to see either the whole or part of the stereograph. The lens cells are so constructed that the lenses may be removed or reversed, or replaced by other lenses or prisms.

An improved fire escape consisting of a friction device by which a person may safely descend a rope, has been patented by Mr. Winfield S. Beebe, of Middletown, Conn. The friction is applied to the rope by a grip consisting of a couple of studs, attached to the opposite side of a disk which turns in a block through which the rope runs. The rope also passes between the studs, which are so fixed with respect to the handle attached to the disk that when a person is suspended from the handle the studs make short reverse bends in the rope, creating friction to retard the descent.

A device for working fans on rocking chairs has been patented by Mr. Alexander Mrozowski, of Newark, N. J. A lever is pivoted to one of the rockers of the chair that has a roller in its outer end and is attached at its inner to a cord wound on a shaft at the top of the chair back, that carries the fans. The shaft is provided with a spring that holds against the action of the cord. When the chair is rocked in one direction the lever draws the cord and rotates the fans, and in the opposite direction the cord is released and the spring rotates the fans and winds the cord.

An apparatus for preventing sea bathers from being carried out by the waves, tide, or undertow has been patented by Messrs. Lorenzo D. Smith, of Baldwin, and John B. Smith, of Patchogue, N. Y. A movable carrier is loosely mounted on a cable attached to a float some distance from the shore and to a standard on the shore. Ropes attached to the carriers are also attached to the bathers, and the carriers are moved to or from the shore by means of ropes passing over a pulley on the float, and connected to a windlass on the shore.

Mr. Frederick W. Hawes, of Algona, Ia., has patented an improved snap hook which can readily be attached to ropes or round straps. The invention consists in a hook provided with a grooved shank to which is pivoted a latch provided with a cam-projection and with jaws fitting against the sides of the hook. Into this grooved shank the rope or round strap is passed, and a grooved strip provided on its inner sides with studs is placed on it, and pressed upon the rope by the cam-projection of the latch, when the latch is swung down, thus holding the rope to the shank.

A jointer for jointing basket staves has been patented by Mr. Warren E. Hinchey, of Evanswood, Wis. A vertically moving sash moves in guides on the frame of the jointer, and is provided with knives for jointing the staves, while they are supported by a form attached to the frame. The forms have clamping faces of curved form, and holding blocks, having similar form, compress and hold the staves on the form to the desired curvature to cause the descending knives to suitably cut and bevel the edges of the staves.

An ear piercing implement, so constructed that the lobe of the ear is pierced and the hook of the earring inserted in the ear at one operation, has been patented by Mr. Frederick Rosenberg, of New York city. A point, sharp at one end and hollow at the other, is placed upon a handled spindle and pressed through the ear, leaving the hollow end of the point protruding a little from the ear. The spindle is removed and the hook of the earring is inserted in the hollow end of the point, and both are drawn through the ear. The point is then removed, leaving the ring in the ear.

A new process of manufacturing photographic emulsions has been patented by Mr. Thomas H. McColten, of Philadelphia, Pa. On an upright shaft fitted for revolution at a high speed, is a cross arm, from which are suspended vessels by jointed links. Within these vessels are filled glass vessels provided with funnels near their lower ends. The emulsion is placed in the vessel and the shaft rotated, the centrifugal force and gravity causing the excess of silver salts to pass through and beneath the funnels to be used again.

A simple and reliable escapement for mechanisms that require a reciprocating rotary movement, has been patented by Mr. Charles T. Mason, of Sumter, S. C. To the post of the last wheel of a clock train is attached an escapement wheel, that is made in the form of a bevel gear wheel with part of its teeth cut away. The teeth of the escapement wheel mesh successively into the teeth of two bevel gear wheels, on a shaft at opposite sides of the escapement, and give to the shaft and its attachments a reciprocating rotary motion.

An improved cattle guard for railway crossings has been patented by Mr. Robert Armstrong, of Neodesha, Kan. It is a vertically-swinging gate pivoted to suitable standards, with its lower end jointed or hinged to one end of a platform, having its opposite end hinged to a crank shaft journaled in short standards, so that when an animal steps on this platform the gate will be swung upward toward the animal and will stop it. The platform can be provided at its inner end with a projection which strikes against the rail and forms a check for the movements of the platform.

An improved method of taking up the wear of vehicle axles has been patented by Mr. Emeri Brulé, of Neillsville, Wis. On the outer end of the axle journal is a screw threaded tenon that is of more than twice the length of the ordinary tenon. On this tenon is applied a screw threaded sleeve of such length that its outer end shall be flush with the outer end of the axle box. When the axle and box have worn, so that there is too much play, the sleeve is taken off and is turned off to reduce its length, so that when again put in place its outer end will be flush with the end of the box.

Mr. Benjamin Verity, of St. Pancras, County of Middlesex, England, has patented an improved burner for gas fires, made of fire clay or a mixture of fire clay and silicate, or of other plastic material. The improvement is designed to facilitate the manufacture of the burner, to afford the necessary freedom for expansion and contraction, and prevent fracture when in use; to insure a more complete and intimate mixture of the gas and air, and to raise the temperature of the gases before they enter into combustion. The invention consists in constructing the burner of a number of sections or parts juxtaposited and fitted together.

A novel vessel for preserving butter has been patented by Mr. William D Sprague, of Henry's, N. C. The jar or vessel is made in the form of a tube open at both ends. The exterior ends of the cylinder are provided with screw threads upon which screw rings work to close the vessels after the butter or other material has been placed therein. The vessel is filled by pressing the open cylinder directly into a mass of butter until the cylinder is filled up even with both ends. Disk covers are then placed against the butter at each end of the cylinder, and over these disk covers the screwrings are applied and screwed firmly up, effectually closing both ends of the cylinder.

An improved eaves trough hanger has been patented by Mr. William F. Stoetzel, of Omaha, Neb. This invention consists in a hanger of peculiar form, adapted for a roof of any pitch, and shaped to prevent sagging of the trough. The hanger is a strip of metal having its upper end bent at an angle to suit the pitch of the roof to which it is to be attached, and split at its lower end to form the two tongues which are bent in opposite directions for attachment to the crossbar of the trough. The split end of the hanger, provided with the tongues, bent as described, gives a wide bearing and support for the trough, so that it is retained in shape and prevented from sagging to either side in case ice or dirt accumulates upon the trough.

An improved centrifugal honey extractor has been patented by Mr. Joseph K Rudyard, of East Northport, N. Y. The machine consists in a series of comb holders resting on a plate or frame loosely mounted on a vertical shaft in a vessel, the comb holders having pivots or pintles projecting from the bottoms, on which pintles pinions are mounted, which engage with a cog wheel rigidly mounted on the shaft below the loosely mounted plate, this cog wheel being provided on its upper surface with a series of notches, and the plate or frame being provided on its under side with a pawl strip adapted to catch on the notches, so that the honey will be thrown from the combs by the centrifugal force when the shaft is rotated, and when the motion of the shaft is slackened the comb holders will be reversed. The comb holders can thus be reversed very rapidly and easily by simply retarding the motion of the cog wheel by holding back on the crank.

Mr. William W. Goodwin, of Philadelphia, Pa., has recently patented an improvement in gas heating stoves. The object is primarily to utilize the heating power of the gas to the greatest possible extent, and at the same time to get rid of the products of combustion without allowing them to enter the room where the stove is used. Gas stoves have heretofore been connected with an escape flue, so that the burned gases may escape to the chimney; but as formerly made such stoves have not been economical in the use of gas on account of the escape to the chimney being too direct and free. In burning gas for fuel it is not necessary to provide a draught in order to promote combustion, as is the case in using solid fuels; but all that is required is to carry off the burned gases or products of combustion after their heating properties have been utilized to the greatest possible extent. To attain the best possible results this inventor constructs stoves to give heat by reflection and radiation from the gas flames, and by convection by heating a current of air passed through the tube, and further provides for detaining the heated products of combustion as long as possible within the heating chamber of the stove.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

For Sale.—Iron Planer, 50″ x 54″ x 16 ft.; engine lathes, 25″ x 20 ft., 21″ x 8 ft.; also six other lathes of various sizes, in A No. 1 condition. Apply to or address John Steptoe & Co., 214 W. Second St., Cincinnati, O.

Wanted.—Copper Ores Address Stillman & Koefoed, 40 and 42 Broadway, New York city.

Knudson Electrical Company, Limited, No. 39 Nassau St., New York, undertakes the patenting and sale in Europe of meritorious inventions on commission.

CHICAGO, October 25, 1882.

H. W. Johns M'f'g Co., 87 Maiden Lane, New York.

DEAR SIRS: I have been using your Asbestos Packing, and can recommend it to engineers and the public generally as the best packing in use. W. CORLIS, Engineer, Sargent, Greenleaf & Brooks, 43 Franklin St., Chicago, Ill.

American Fruit Drier. Free Pamphlet. See ad., p. 301

Am. Twist Drill Co., Meredith, N. H., make Pat. Chuck Jaws, Emery Wheels, Grinders, automatic Knife Grinders.

Fire Brick, Tile, and Clay Retorts, all shapes. Bornerg & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Drop Forgings of Iron or Steel. See adv., page 302.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

Brass & Copper in sheets, wire & blanks. See ad. p. 302.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 20,000 Crank Shafts and 15,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Diamond Drills, J. Dickinson, 64 Nassau St., N. Y.

Eagle Anvils, 10 cents per pound. Fully warranted.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 302.

Garmore's Artificial Ear Drums for relief of partial or entire deafness. Invented by one who has been deaf thirty years. Simple and scientific in construction; not observable in use. Send for circular. John Garmore, S. W. cor. 5th and Race Sts., Cincinnati, O.

Schools open.—Send for Catalogue of Drawing Materials. Keuffel & Esser, New York.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 300.

Red Jacket Adjustable Force Pump. See adv., p. 302.

Pays well on small investment.—Stereopticons, Magic Lanterns, and Views illustrating every subject for public exhibitions. Lanterns for colleges, Sunday-schools, and home amusement. 116 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., N. Y.

Fine Taps and Dies in Cases for Jewelers, Dentists, Amateurs. The Pratt & Whitney Co., Hartford, Conn.

Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 302.

Trevor's Patent Key Seat Cutter. Trevor & Co., Lockport, N. Y. See page 302.

Wanted.—A situation by a practical "nickel plater" who understands polishing, grinding, dipping, and brass finishing. Address W. H. Wright, Indianapolis, Ind.

For Sale Cheap—One Boiler Plate Power Punch and Clipper. Inquire of Noble & Hall, Erie, Pa.

The Double Induction Motor and Automatic Battery, Griscom's patents, are manufactured and for sale by the Electro Dynamic Co., Philadelphia. This little electric motor, illustrated and described in our editorial, June 24, 1882, is now on exhibition at the American Institute Fair, Alcove 14, New York. Power from 1,000 to 6,000 ft. lb., according to battery. Weight 2½ lb. The only practical power for driving the family sewing machine, small lathes, dental and surgical instruments, etc. 1,000 stitches per minute on the sewing machine. 7,000 revolutions per minute on dental tools. Apparatus complete for sewing machines, lathes, $35 and $40. Dental apparatus, nickel plated, complete, $50.

Cope & Maxwell M'f'g Co.'s Pump adv., page 285.

The Berryman Feed Water Heater and Purifier and Feed Pump. I. B. Davis' Patent. See illus. adv., p. 285.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 286.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 286.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 286.

4 to 40 H. P. Steam Engines. See adv. p. 286.

Sheet and cast brass goods, experimental tools, and fine machinery. Estimates given when models are furnished. H. C. Goodrich, 66 to 72 Ogden Place, Chicago.

Drop Forgings. Billings & Spencer Co. See adv., p. 270.

Improved Skinner Portable Engines. Erie, Pa.

Engines, 10 to 50 horse power, complete, with governor. $250 to $550. Satisfaction guaranteed. Nearly seven hundred in use. For circular address Heald & Morris (Drawer 127), Baldwinsville, N. Y.

25″ Lathes of the best design. G. A. Ohl & Co., East Newark, N. J.

Collection of Ornaments.—A book containing over 1,000 different designs, such as Crests, Coats of Arms, Vignettes, Scrolls, Corners, etc., will be mailed free on receipt of $1. Address Palm & Fechteler, 6 West 14th Street, New York.

Combination Roll and Rubber Co., 68 Warren street, N. Y. Wringer Rolls and Moulded Goods Specialties.

Pure Water furnished Cities, Paper Mills, Laundries, Steam Boilers, etc., by the Multifold System of the Newark Filtering Co., 177 Commerce St., Newark, N. J.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock Mfg. Co., 80 to 88 Market St., Chicago, Ill.

First Class Engine Lathes, 20 inch swing, 8 foot bed, now ready. F. C. & A. E. Rowland, New Haven, Conn.

Ice Making Machines and Machines for Cooling Breweries, etc. Pictet Artificial Ice Co. (Limited), 142 Greenwich Street. P. O. Box 3083, New York city.

Jas. F. Hotchkiss, 84 John St., N. Y.: Send me your *free* book entitled "How to Keep Boilers Clean," containing useful information for steam users & engineers. (Forward above by postal or letter; mention this paper.)

Steel Stamps and Pattern Letters. The best made. J. F. W. Dorman, 21 German St., Baltimore. Catalogue free.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Presses & Dies (fruit cans) Ayar Mach. Wks., Salem, N. J.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works. Drinker St., Philadelphia, Pa.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

NEW BOOKS AND PUBLICATIONS.

ROCKS, MINERALS, AND STOCKS. By Frederick H. Smith, Chicago. *The Railway Review.*

Mr. Smith discusses rocks and minerals from the standpoint of the mining engineer, assayer, and expert. His style is apt to be freer than comports with a sober scientific treatise, and his vocabulary is rather that of the "street" than of critical science or literature. Nevertheless, his book is well packed with practical information, and is likely to meet with favor among, and prove a real utility to a class of men whose interest in mines and minerals is chiefly speculative. The chapters on stock companies, stock dealing, stock tricks, and so on, are calculated to increase the wariness of intending investors in mining stocks and properties.

MAGNA CHARTA STORIES. Edited by Arthur Gilman. Boston: D. Lothrop & Co.

A dozen tales of heroism, told by various writers, with varying merit, intended to stimulate in young people a love of history. The idea is a good one, and the book seems well suited for its purpose.

THE AGE OF FABLE; OR, BEAUTIES OF MYTHOLOGY. By Thomas Bulfinch. Enlarged edition, edited by E. E. Hale. Boston: S. W. Tilton & Co. $2.50.

This is a most acceptable edition of Mr. Bulfinch's popular and useful work, enlarged by many references to the principal literary writings of the thirty years since the work was originally prepared. Nearly twenty recent English writers have thus been drawn upon by the editor, who has also considerably extended the chapters relating to the religions and mythologies of the far East. The admirable plan of Mr. Bulfinch's work has not been changed. The new edition is handsomely printed in large, clear type, the size of the page also having been materially increased.

PUBLICATIONS OF THE WASHBURN OBSERVATORY OF THE UNIVERSITY OF WISCONSIN. Vol. I. Madison, Wis.: State Printer.

This, the first publication of the Washburn Observatory, contains a description of the buildings and instruments, with several illustrations, records of the first year's work of the Observatory, observations and drawings of the great comet of 1881, and other papers of value.

CHAUTAUQUA SCIENTIFIC DIAGRAMS. Series No. 1. Geology. By A. S. Packard, Jr. Providence, R. I.: The Providence Lithograph Co.

This series embraces ten large and carefully drawn diagrams, designed to illustrate broadly the actions of water and heat in giving character to the earth's surface, and the varying aspects of the American Continent, and the typical animal and vegetable forms during the great geological periods. The drawings are accompanied by an explanatory text-book, "Easy Lessons in Geology," noticed some weeks ago.

AROUND THE HOUSE. Rhymes by Edward Willett. Illustrations by Charles Kendrick. New York: R. Worthington.

By long odds the most commendable child's book yet made in this country. The verses are bright, rhythmical, and intelligible to American little folk, while the illustrations are artistic and charming. There is a refreshing element of naturalness and honesty about both pictures and verses, with an equally refreshing absence of cant and pretense that cannot fail to make the book as popular with parents as it is sure to be with children.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) J. K. H. writes: A friend of mine has a 6½ horse power engine. Upon starting it the water rose in the boiler, and a friend advised him to put a quart of petroleum in the boiler. I desire to have your opinion as to whether it would be advisable to put petroleum in a boiler to settle the water? A. Would not advise you to put petroleum or anything into your boiler but the purest water. Dirty water will make a boiler foam. Probably you started the engine too suddenly, or opened the valve widely, this may have caused a temporary foaming. If the boiler with clean water will not drive the engine steadily at the speed you require without foaming so as throw water into the cylinder, it shows that the boiler is too small or you are trying to get too much work from it.

(2) E. E. T. writes: Can you give me a receipt for making a silver dip? It is used in manufacturing companies where they have a large amount of small brass work to silver, such as eyelets, buttons, corset trimmings, etc., and do not use a battery. A. Dissolve two ounces of nitrate of silver in a quart of water, add a solution of common salt until no more precipitation takes place. Pour off the liquid, wash the precipitate thoroughly, and dissolve it in a solution of cyanide of potassium in five times its bulk of water. Filter the solution, make it up to a gallon by adding water, and it is ready for use. The brass must be quite bright, and allowed to remain in the bath until of sufficiently deep color. The articles are then removed and washed.

(3) W. M. T. asks what to mix with lamp black to make a plumber's joint to keep the lead in proper place. A. The plumber's black is lamp black, glue, and water. Boil a small piece of glue in water; just enough to make the solution feel sticky between the fingers, then stir in lamp black enough to make it of the consistence of very thin paint when cold. If it should be too stiff when cold for the brush, add more water.

(4) E. P. B. W. asks for the best way to cut holes one thirty-second to three-eighths of an inch in glass shades or covers. A. If you have many to cut use a diamond drill. A hole can be drilled with a very hard steel drill and turpentine. 2. How to give Britannia or white metal a brass coating? A. Coating white metal with brass. This can be done by the electro process, using a solution of 2½ parts sulphate of copper, 20 parts sulphate of zinc, and 45 parts cyanide of potassium, in 300 parts of water. The anode should be two plates of zinc and copper of equal size. Battery should be strong. If the brass does not deposit clear and even, start it in a solution of sulphate of copper and cyanide, as the various compositions of white metal do not have as good electric affinity as the copper.

(5) A. J. asks: 1. What is parchment paper as used for battery purposes, as described in the Reynier battery in SCIENTIFIC AMERICAN of July 22, and where can it be obtained? A. Ordinary paper dipped in dilute sulphuric acid, and well rinsed off with water. May be bought at any chemical or electrical apparatus shop. 2. What principle of construction has been found the most economical for an electric motor, and at the same time the highest? A. See "The Double Induction Motor," No. 25, vol. xlvi., SCIENTIFIC AMERICAN.

(6) C. R. asks if a rotary engine of 3 horse power will drive a boat 25 feet long, 5 foot beam; and what would be the most economical style and size of boiler? What would the size of propeller be? A. It would probably drive your boat three to four miles per hour. A vertical tubular boiler would suit you best. The size of the screw depends somewhat on draught of water; about 18 inches to 22 inches diameter.

(7) R. W. N. asks: Can you tell me of some effective substance to put within the double sides of a refrigerator? I would like something light. A. Powdered dry charcoal (not too fine) is best. Dry sawdust is commonly employed, and answers the purpose very well.

(8) J. E. B. asks: 1. What will be the diameter of the air pump (single acting)? A. Air pump 8 in. diameter, if 5 in. stroke. 2. Circulating pump (double acting); the stroke being 5 inches? A. 6½ in. diameter, if 5 in. stroke, if these pumps are worked direct by steam engine. 3. How many square feet of cooling surface for an engine of the compound system (surface condenser), having two cylinders, one 9 inch diameter by 10 inch stroke, using the steam direct from the boiler, and expanding in another cylinder of 17 inches diameter by 10 inch stroke, and then to the condenser; the steam pressure being 100 lb. to the square inch? A. Condenser 260 to 270 ft. surface.

(9) J. K. T. says, in answer to E. F. B.: I have found it to be a curious fact that by putting into a pan of any size, water (cold) two or three inches deep, placing a cloth (any kind) also in bottom of pan or vessel, then placing a glass fruit jar, without any previous preparation, upon the cloth, surrounded slightly by the cold or cool water, he may with impunity fill the can with hot liquid.

(10) S. C. T. asks: 1. How can I fill up a broken place in a marble slab, it to remain perfectly steady, so as to make the broken place perfectly hard and smooth? A. This, we think, is impossible. Plaster of Paris mixed with a little oxide of zinc, will make a hard, white filling, but it cannot be polished like the marble. 2. Also, give your opinion in regard to the quality of marble, in the commercial value of Vermont and Italian marble. This I wish to settle a question in regard to which is the finer, Vermont or Italian marble, for general use? A. The qualities of these marbles vary. Italian marble ranks the highest in the market.

(11) T. C. H. asks: What will be the size of the smallest boiler from which I can get six horse power? A. Depending upon the kind of boiler, you should have from 75 to 110 ft. fire or heating surface—the greater proportion in tubular boilers vertical. 2. Has coal oil been successfully used to generate steam for a locomotive? A. We believe coal oil is not yet used economically, but many boilers are run with it in the oil regions, where it has comparatively little value.

(12) B. W. S. asks: Is white lime mortar a preservative for wood and iron? A. No; but hydraulic lime is preservative.

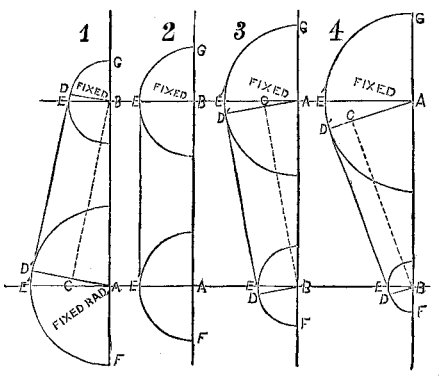
(13) O. B. asks for rules for the construction of symmetrical cone pulleys. A. The following formula, by Rankine & Cooper, for pairs of three pulley cones that are alike, gives good results:

Where R′ = diam. of large pulley
R″ = " " small "
R = " " middle " *required* } in inches.
C = dist. " centers "

Then $\frac{R' + R''}{2} + \frac{(R' - R'')^2}{6\,28 \times C} = R$, the diameter of the middle pulley in inches. Or, in plainer words, the middle pulley must be made a little larger than the mean of the diameters of the large and small pulleys. Where four or more pulleys are required, or one cone smaller than the other, the computation becomes more complex, and can be done in the following manner:

First—Compute the speeds required approximately, and make the speed sizes a fixture for one complete cone, and the largest pulley upon the other cone.

Then make a diagram as here shown, putting in place



of the word *fixed*, the semi-diameters in figures of the speed sizes assigned. Beginning with Fig. 1, compute the half belt length.

The dotted line, B C, being parallel with and of the same length as the straight part of the belt for all the pairs, and A B the distance of the centers, which may be marked upon the diagram, all the triangles will be found proportional and their relative values found as follows:

No. 1. A D′ − B D = A C.

No. 2. $AB^2 - AC^2 = BC$ = straight part of belt. D′ D.

No. 3. A B : A C :: A E′ : D′ E′ = the lap in excess of 90°.

No. 4. A B : A C :: B D : D E = the lap less than 90°.

Then

$\left.\begin{array}{l} \frac{D\,B}{2} \times 3{\cdot}1416 - D\,E = D\,G \\ \frac{A\,D'}{2} \times 3{\cdot}1416 + D'\,E' = D'\,F \end{array}\right\}$ + B C above = half belt length.

For Fig. 2. E E′ = distance of centers or straight part of belt.

$\frac{B\,E}{2} \times 3{\cdot}1416 = G\,E$.

Half belt length − G E E′ = E′ F.

Then

$\frac{E'\,F \times 2}{3{\cdot}1416} = A\,E'$ = radius of required pulley, Fig. 2.

For Fig. 3. $\frac{A\,E'}{2} \times 3{\cdot}1416 = G\,E'$ Find D′ E, as in No. 3.

Find D′ D, as in No. 2, and D E, as in No. 4.

Half belt length − $\underbrace{G\,E' + D'\,E' + D'\,D}$ = D F

Then

$\frac{D\,F + D\,E \times 2}{3{\cdot}1416} = B\,D$ = radius of required pulley, Fig. 3.

For Fig. 4, the same formula as for Fig. 3.

The small difference for the curve of the overlap, D′ E′ may be overlooked in practice.

(14) F. D A. asks: 1. Will you please tell me what part is iron of the iron ores found at Iron Mountain, Mo., and at the other iron mines in the United States? A. From 32 to 48 per cent iron. Some of the clay ores run as low as 27 per cent. 2. With what wind—*i. e.*, whether fair, beam, or otherwise—will a sail boat attain its greatest speed, and on what principle? A. If properly rigged, usually on the three-quarter beam. See "Velocity of Ice boats," in SUPPLEMENT, No. 214. The same laws apply here.

(15) G. S. asks: 1. How many feet of wire are required for the primary and secondary coils of an induction coil, the current of which is supplied from a single Smee's cell, pint size, so as to give shocks as great as can possibly be borne, and of what size wire? A. Make the core of the coil half an inch in diameter and five inches long, wind it with four layers of No. 20 magnet wire; cover this with two thicknesses of shellacked writing paper, and wind around this about ten or twelve courses of No. 36 silk covered wire. 2. Would cotton covered wire answer well? A. Cotton covered wire will answer, but not as well. 3. Is electro-magnetism affected by the size of a cell or by several? A. It depends upon the winding. If wound with coarse wire large cells are best adapted to it. 4. Is there any battery more powerful than Grove's, and how is it constructed? A. No; but the bichromate batteries are more desirable on account of the absence of smell. 5. Would thin lead foil answer for a Faure's secondary battery, and could it be charged from a plate electrical machine? A. Rather thick lead is to be preferred, say one-sixteenth of an inch thick. It may be charged very feebly by a plate machine. 6. What battery is most suitable for an induction coil? A. For continuous use employ the gravity battery; for occasional use the Grenet answers well. 7. In what proportion does Smee's, Bunsen's, and Leclanche's stand to Grove's battery? A. The electromotive force of the Grove battery is 1·956 volts; Bunsen's, 1·964; Smee's, 1·090 volts; Leclanche, 1·481 volts.

(16) F. C. F. asks: 1. The best and easiest way to polish a violin? Have been using shellac dissolved in alcohol, but don't like it. It is too much work to apply, and does not give satisfactory results. Is

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there any kind of oil that can be added to give more body to the varnish, and at the same time have no injurious effect on the tone? A. Use best French spirit copal or amber varnish. It is much cheaper and more satisfactory to buy than to attempt making either of these. 2. Also a good stain for staining them so they will look well? Have used extract of logwood, but the color is too red. A. Use a warm solution of one ounce bichromate of potash in a pint of water, and touch up with nitric acid diluted with an equal volume of water if necessary. 3. Can you give me any information about the cutting of gear wheels for screw cutting lathes? I mean particularly the size of a train for cutting any particular number of threads to the inch, say, for example, twelve threads. What size should they be, beginning with one on spindle? How many teeth to each wheel, and what size mesh? Can you refer me to any good work on the subject, one that is easy understood? A. The makers of lathes arrange the sizes of gears to accommodate the distance between the center of the lathe head and the driving screw. The pitch of the thread on the driving screw must first be decided; then the sizes of the train wheels are to be computed by the number of teeth; then the pitch multiplied by the number of teeth gives the diameters. Much judgment and experience is needed in deciding the pitch or size of the teeth and arranging the best proportion. Would advise you to study the gears on the lathes in a machine shop. See "Notes and Queries," No. 31, page 322, May 20, 1882. Martin on Screw Cutting, and Joynson on Gearing are good works.

(17) H. O. T. writes: I would be pleased to have you give the receipt for a paste which is used by binders in making tablets, so that there is no necessity of pasting a strip of paper over the part that is glued together. The paste is colored a high color to suit the taste of the patrons. The tablets are not glued first, only thick paste put on the whole lot to be made, and afterward, when dry, a knife is run through where the tablets are to be parted, making an easy and neat looking job? A. The composition is said to be prepared as follows: Glue, four pounds; glycerine, two pounds; linseed oil, half pound; sugar, one-quarter pound; aniline dyes, q. s. to color. The glue is softened by soaking it in a little cold water, then dissolved together with the sugar in the glycerine, by aid of heat over a water bath. To this the dyes are added, after which the oil is well stirred in. It is used hot. Another composition of a somewhat similar nature is prepared as follows: Glue, one pound; glycerine, four ounces; glucose sirup, about two tablespoonfuls; tannin, one-tenth ounce. Give the compositions an hour or more in which to dry or set before cutting or handling the pads.

(18) H. H. H. writes: I am engaged in making artificial ice, and on account of alkali and other impurities in the water the ice is not clear. The water is frozen in cans one foot square and three feet long, making a block of ice the same size. The center of the block is not good, owing to the outside freezing first, and the impurities in the water going to the center and freezing last. Now I wish to know what to put in the water to precipitate it that will not make the water taste or be injurious, as the ice is used for a great many purposes. Or, how can I purify the water to make my ice clear? A. It is very difficult to purify water economically so that it may be artificially congealed in clear cakes. Perhaps the most effectually remedy is to boil the water and then filter it through charcoal. Ordinarily no simple addition to or doctoring of the water will suffice.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

A. G.—1. Quartz with silver glance. 2. Obsidian.—D. J. C.—Both are fine grained sandstones, and No. 1 would make a fine building material, as it contains but little iron. No. 2 is inferior for this purpose.—J. S. R.—No. 1. Quartz, holding a green mass of hornblende. No. 2. Crystals of calcite—carbonate of lime. No. 3 was not large enough to test. No. 4. Carbonate of copper, malachite, and red oxide of copper, with a small proportion of silicate of copper, crysocolla. No. 5. Mispickel, sulpho-arseniate of iron—sulphur, arsenic, and iron.—C. E. P.—Sample A, Copper pyrites—zinc blende and iron pyrites in quartz, probably contains gold and silver, but not in quantity. An assay would be advisable. B, Crystals of chondrodite in granular limestone, of no metallurgical value. C, Crystals of quartz in a quartz gangue, containing gold and possibly silver. An assay will be necessary to determine the amounts. D, Copper pyrites, with malachite in quartz, which holds silver. Small unlabeled piece in package with D, chondrodite and rutile on granular limestone (of no value).

[OFFICIAL.]

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October 24, 1882,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 261 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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Grain drier, H. Cutler *et al.*, N. Wilbraham, Mass.
Hides, machine for scouring, C. Holmes, Boston, Mass.
Hides, treating, W. Maynard, New York city.
Horseshoe calk sharpener, F. A. Roe, New York city.
Paper bag machinery, M. N. Stanley, New York city.
Spinning machinery, F. Gebhart, New Albany, U. S.
Sulphuric acid, concentrating, J. Gridley, Brooklyn, N. Y.
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Tricycle, H. C. Bull, Brooklyn, N. Y.

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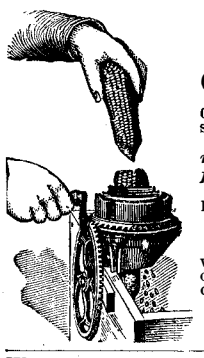

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Price $5, or handsomely nickel plated, $6.

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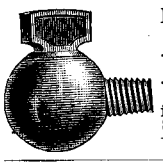
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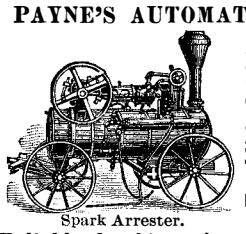
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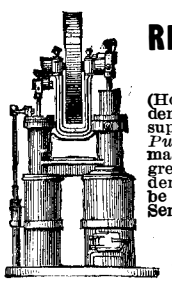
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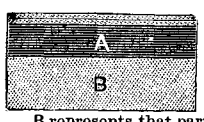
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IRON TOOLS, ENGINES & SUPPLIES.
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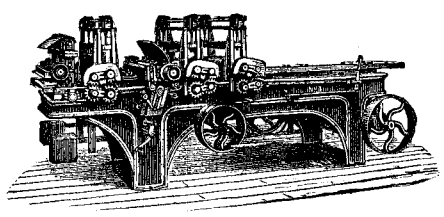
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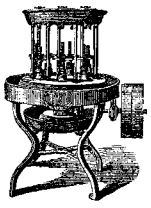
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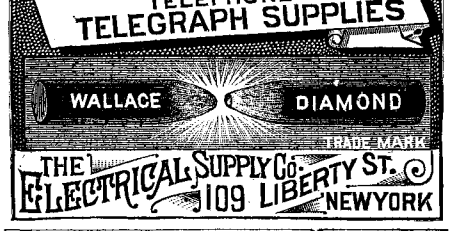
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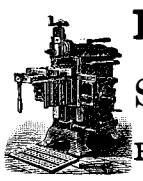
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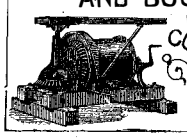
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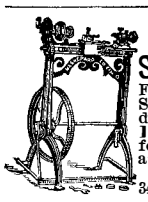
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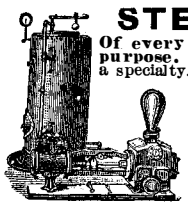
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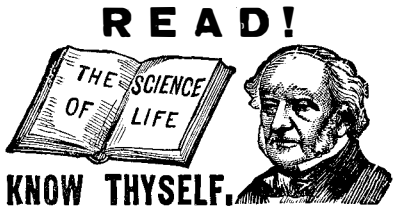

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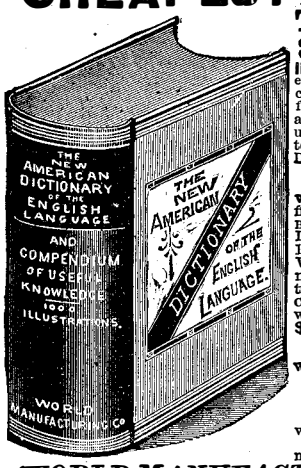
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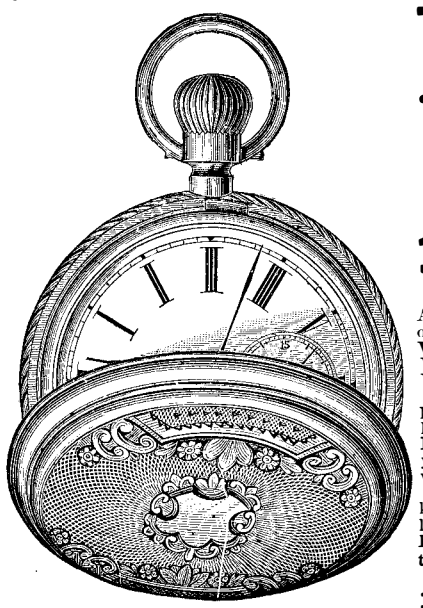

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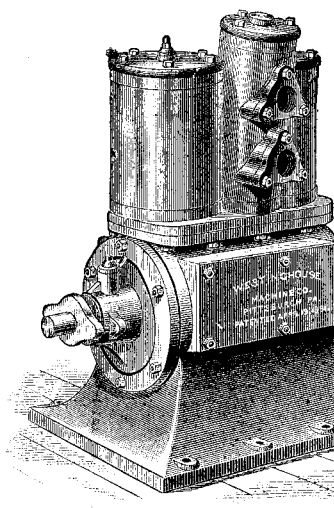

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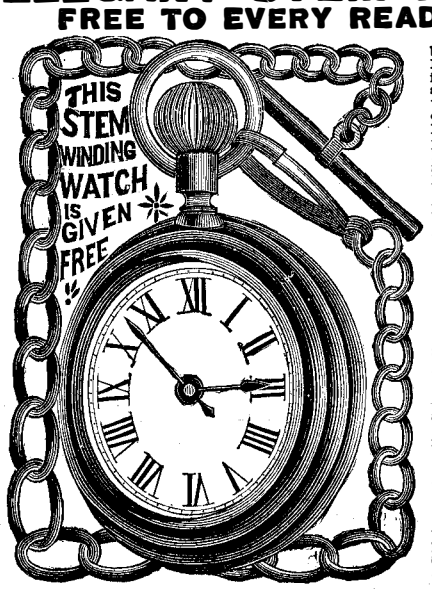

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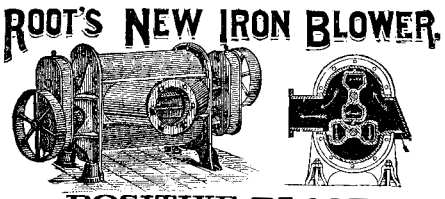

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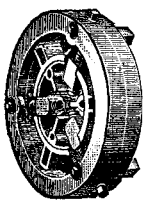

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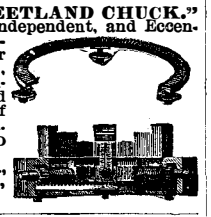

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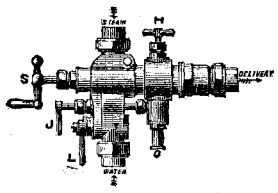

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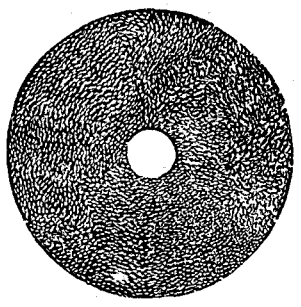

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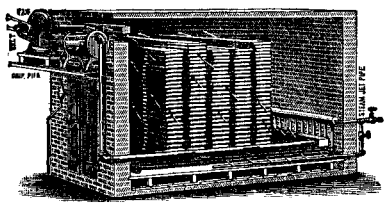

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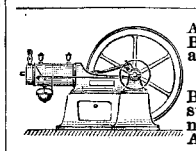

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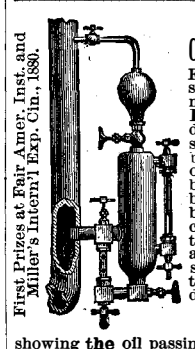

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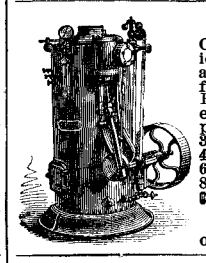

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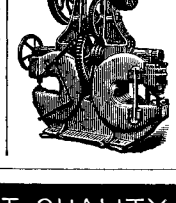

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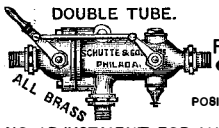

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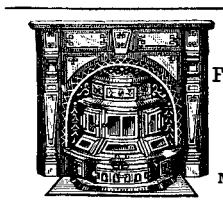

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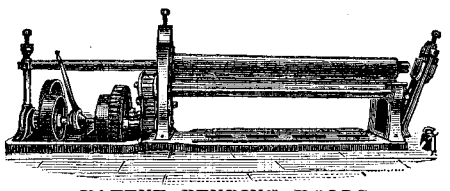

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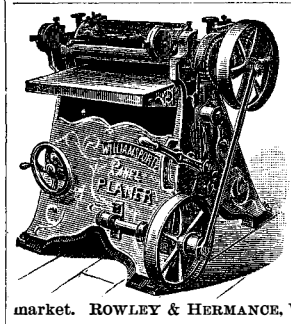

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